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ROYAL COMMISSION ON TUBERCULOSIS (HUMAN AND ANIMAL).

SECOND INTERIM REPORT

OF THE

ROYAL COMMISSION

APPOINTED TO INQUIRE INTO THE RELATIONS OF

HUMAN AND ANIMAL TUBERCULOSIS.

PART II. APPENDIX.

VOLUME I.

THE PATHOGENIC EFFECTS OF BOVINE VIRUSES.

DR. A. STANLEY GRIFFITH.

Presented to both Houses of Parliament by Command of His Majesty.

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THE NUMERICAL ESTIMATION OF TUBERCLE BACILLI IN SAMPLES OF TISSUE EMULSIONS AND OF MILK.

DR. ARTHUR EASTWOOD.

THE NUMERICAL ESTIMATION OF TUBERCLE BACILLI IN SAMPLES OF TISSUE EMULSIONS AND OF MILK.

When I took up my duties in 1903, the Commissioners asked me to estimate for them, as accurately as possible, the richness in tubercle bacilli of the tissue emulsions which they used for the more important animal inoculations. At the request of Dr. Sidney Martin, I began the work by ascertaining whether useful results could be obtained by counting the bacilli in stained films containing definite amounts of material which had been measured out by means of a Nabarro's pipette. This method I found satisfactory. It has, therefore, been employed throughout the work on the estimation of doses. I have received valuable assistance in this work from my laboratory attendant, Mr. F. Nicholls. Under my instruction he learnt all the details of the process, and, after a short time, I found that I was able to entrust him with the requisite manipulations and with the labour of counting. His work has been done under my close supervision, and I can vouch for its accuracy. Out of a total of 139 estimations about 120 are due to him.

Technique.

The samples to be estimated are sent to me from the experimental farms in sealed test-tubes. A preliminary film is first made in order to see whether dilution will be necessary and to form an estimate of the degree of dilution, if any, which will be desirable. When it is impossible, owing to pressure of work, to deal with the samples immediately, they are diluted with an equal volume of 2 per cent. phenol before being sent to me. Except in the case of milks, dilutions are only made in my laboratory when the examination of the preliminary film shows that the number of bacilli is very high. In the case of milks, however, a dilution of at least 1 in 5 in normal saline is usually made, unless the milk is very thin and serous, because it is found that films of undiluted milk have a tendency to peel off the coverslip.

After examination of the preliminary film, the sample in the test tube is well shaken and a portion of it is then poured out into a watch glass and is continuously emulsified with a rounded glass rod for five minutes. When a dilution has been decided upon, a measured quantity of this emulsified material is used for the purpose, the diluent employed being normal saline. The diluted material is thoroughly mixed for at least five minutes. When it is necessary to make a high dilution, the method of progressive dilution is employed, the mixing process being repeated after each step in the dilution.

The material to be counted is measured out on to coverslips by means of a Nabarro's pipette. Except for the last two or three estimations, the same pipette has always been used. This instrument is a small pipette which bears graduations representing a volume of 5 cubic millimetres. At the upper end of the pipette is a stout rubber teat on which a metal screw is clamped. By manipulation of the screw, material can be slowly drawn into or ejected from the lower end of the pipette. The liquid to be measured is drawn up into the tube a short distance past the lowest 5 c.mm. mark. By carefully touching the end of the tube with blotting paper and at the same time controlling the screw on the rubber teat, the liquid in the tube is reduced in amount until it measures exactly 5 c.mm. This amount is then discharged on to a perfectly grease-free coverslip. The process is repeated until the requisite number of films has been prepared. When the films are dry and have been fixed, they are stained in carbol fuschin, with steam gently rising, for 20 minutes. I make it a rule to have every film stained for at least 20 minutes, because I have found that shorter exposure to the stain fails, in some instances, to stain all the bacilli present; 25 per cent. HCl. is used to decolourise the specimens. I do not consider that there is any danger of decolourising the tubercle bacilli with this strength of acid when the specimens have been stained in the way described. The specimens are counterstained with methylene blue, dehydrated with alcohol, cleared with xylol, and mounted in Canada Balsam. They are not blotted in any part of the process.

The bacilli in the entire film are then counted with the aid of the mechanical stage. The objective used is Zeiss' 3 mm. apochromatic dry lens, and the eyepiece is the No. 6 compensating ocular. Inside the eyepiece is an Ehrlich's stop. It takes from 40 minutes to 2 hours to count a film, the time being longer when the bacilli are numerous and when the material in which they are contained is dense. The work of counting involves severe eye-strain. At the commencement of the work six films were counted for each emulsion, but when the demand for estimations increased it was found impossible to count so large a number. For many of the estimations I have been satisfied with two or three counts; but when the first two or three counts showed large discrepancies, I have ordered one or more additional counts to be made.

When my colleagues desired to make inoculations with pre-arranged doses, they have sent me the sample of emulsion in the morning, and I have telephoned to them the result of the estimation on the afternoon of the same day.

Interpretation of Results.

Tubercle bacilli are not comparable to chemical molecules in a solution; it is therefore impossible to expect that they can be distributed in an emulsion with anything like exact uniformity. In the material actually counted, this degree of inequality in their distribution differs in the case of different emulsions, as will be seen from an examination of the tabular statement appended. In a relatively small number of cases the inequality is marked. These cases are generally emulsions from caseo-calcareous lesions. In lesions of this type it is a matter of common histological knowledge that the distribution of bacilli may be very irregular; some nodules, for example, may contain few or no bacilli, whilst in others bacilli may be fairly numerous; or, again, in the same nodule bacilli may be numerous in a particular patch of breaking down, caseous material and absent, or rare, elsewhere. It is only to be expected, therefore, that these irregularities in the natural distribution of bacilli will sometimes give rise to a corresponding irregularity in the emulsified material.

It is a characteristic of the tubercle bacillus, when growing freely, to form densely packed masses. The question therefore arises, with emulsions rich in bacilli, as to how far it is possible to distinguish and count each individual bacillus. With very few exceptions this has always been possible. In three or four instances only Mr. Nicholls has found a clump which he could not count. These he has referred to me for estimation, and I have only been able to assign to them some roughly approximate number, generally a number between 100 and 200. With these rare exceptions, it has been possible, with care, to count the bacilli in the clumps we have had to deal with. Groups containing from 50 to 70 bacilli have been common; groups containing more than 100 have been very rare; and I do not recollect any group which contained more than 150.

With regard to the validity of my estimates, as a basis for the calculation of doses inoculated, it is to be borne in mind that the material actually counted represented, particularly when dilution was necessary, an extremely minute fraction of the bulk of emulsion prepared for inoculation. The assumption is made that the material counted is a typical sample of the whole.

It is clear that the numbers I give can only be regarded as approximate. In handling these numbers, I have decided that the simplest plan is to treat the work as a matter of arithmetic, without any attempt at "rounding off," or eliminating repeating decimals. Of course with large numbers, running into millions, the actual figures at the end of the whole number are of no individual significance; but I have found it advisable to give the numbers just as they work out, and to leave it to others to lop off whatever they may regard as the negligible quantity.

My own opinion is that these numerical estimates have proved of distinct value to my colleagues in the calculation of their doses. But the method, though useful, has its limits; and these limits have, I think, occasionally been overstepped. For example, in one of my estimates I calculated the number of bacilli per c.c. to be 78,506,666. Everybody will understand that the margin of possible error in this enormous figure must be, at least, some few millions. It is obvious that an estimate of an emulsion so rich in bacilli as this can only be regarded as useful for the calculation of big doses. It is not an estimate which justifies the calculation of a dose of 13,000 bacilli by mere dilution of the original material; but this, I see is the alleged dose of this emulsion with which a bovine was inoculated.

Comparison with Culture Doses.

My colleagues use for culture inoculations bacilli grown on serum. These are finely emulsified, with the aid of saline solution, and their bulk after centrifugalisation is measured. One cubic millimetre is taken as equivalent to one milligramme.

It is therefore of interest, in order to compare tissue emulsion doses with culture doses, to consider the probable number of bacilli contained in 1 cubic millimetre of bacilli grown on serum.

Bacilli grown on serum, even when so finely emulsified that they are suitable for intravenous inoculation into rabbits, form innumerable clumps in which the bacilli are so tightly glued together that it is impossible to count them. After considering possible ways of overcoming this difficulty, I have formed the opinion that reliable estimates of serum-grown bacilli cannot be made by actual counting, on the lines of my tissue emulsion estimations.

There is, however, no difficulty about forming a rough calculation of the number of serum-grown bacilli contained in a given volume of culture. The length of the serum bacillus varies from about ·75 μ to about 2·5 μ and generally averages about 1 μ. The breadth is about ·35 μ on the average. We may then, by elementary arithmetic, calculate how many bacilli, measuring 1 μ by ·35 μ and closely packed together, would occupy a cubic millimetre. The number amounts, roughly, to 8,000 million. This number is no doubt higher than the number actually contained in 1 c.mm. of centrifugalised bacilli, because the bacilli cannot be regarded as all being in close contact with each other. Making allowance for this consideration, probably from 4,000 to 5,000 millions is a rough approximation to the actual figure.

This calculation, admittedly very imperfect, is at least sufficient to show that the great majority of culture inoculations which have been made are very much richer in bacilli than the inoculations with even the largest doses of tissue emulsions.

Arthur Eastwood.

DETAILS OF ESTIMATIONS.

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per c.c. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
B I.	Heifer 30 Precrural Gland	–	6	58·3	87	44	11,666
	Cow 44 Milk	–	3	269·6	409	150	53,933
	Cow 64 Milk Collected Jan. 10th–11th	–	3	79·3	95	60	15,866
	Cow 64 Milk Collected Jan. 12th–15th	–	3	894·6	973	806	178,933
	Cow 64 Milk Collected Jan. 15th–19th	–	3	3,543·3	3,963	2,886	708,733
	Cow 64 Milk Collected Jan. 19th–22nd	½	3	1,349	1,597	1,095	539,600
	Calf 102 Prescapular Gland	–	6	27·5	92	0	5,500
	Calf 126 Prescapular Gland	–	3	4,149	4,833	3,552	829,800
	Monkey 62 Spleen, Lung, and Mediastinal Glands	½	3	106	127	88	42,400
	Pig 8 Mesenteric Gland	–	3	0	–	–	–
B II.	Pig 12 Inguinal and Hepatic Glands and Spleen	–	6	4·5	24	0	100
	Calf 22 Mesenteric Glands	–	6	·6	2	0	133
	Heifer 66 Prescapular Gland	–	3	93·3	98	89	18,666
	G.P.s. 996–9 from Calf 134	$\frac{1}{300}$	3	3,929	4,273	3,680	235,740,000

Details of Estimations—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
B. III.	Original Material Bovine Bronchial and Mediastinal Glands	$\frac{1}{25}$	6	292	462	172	1,460,000
B. IV.	Original Material Bovine Mesenteric Glands	–	3	5,071	5,322	4,863	1,014,200
	Calf 120 Prescapular Gland	–	3	691	909	549	138,200
	Calf 138 Local Lesion and Prescapular Gland	$\frac{1}{10}$	3	6,013·6	6,280	5,782	12,027,333
	G.Ps. 1011–12 from Calf 138	$\frac{1}{5}$	3	915·3	962	870	915,333
	Cow 164 Milk Collected July 13th	$\frac{1}{5}$	3	73·3	78	68	73,333
	Cow 164 Milk Collected July 13th–15th	$\frac{1}{5}$	3	42	48	37	42,000
	Cow 164 Milk Collected July 16th–20th	$\frac{1}{5}$	3	20·3	25	17	20,333
	Cow 164 Milk Collected July 20th–26th	$\frac{1}{5}$	2	35·5	37	34	35,500
	G.Ps. 1148–50 from Milk of Cow 164	$\frac{1}{50}$	2	2,031	2,035	2,027	20,310,000
	Cow 172 Milk	$\frac{1}{5}$	2	94·5	97	92	94,500
B. V.	Original Material Bovine Mesenteric Glands	$\frac{1}{5}$	3	1,936	2,033	1,880	1,936,000
H 2. Sp. A.	Heifer 13 Mesenteric Glands	–	3	0	—	—	—
	Calf 79 Various Glands	–	6	150·5	252	74	30,100
	Calf 89 Bronchial Glands	$\frac{1}{50}$	6	1,583·3	2,414	680	15,833,333

Details of Estimations—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 2. Sp. A.	G.P. 672 from Pig 3	$\frac{1}{100}$	3	617	662	573	12,340,000
H 7. C.M.	Calf 5 Prescapular Gland	–	6	24·16	36	12	4,832
	Heifer 71 Prescapular Gland	–	6	6	19	2	1,200
	Cow 73 Supramammary Gland	–	6	124·83	163	66	24,966
H 8. S.C.	G.Ps. 912-5 from Calf 177	$\frac{1}{200}$	3	2,024·6	2,217	1,761	80,986,666
	Calf 275 Local Lesion	$\frac{1}{10}$	4	1,038·75	1,300	783	2,077,500
	G.Ps. 1228-9 from Calf 275	$\frac{1}{300}$	3	3,476	3,621	3,342	208,560,000
	Calf 305 Thoracic Gland	$\frac{1}{25}$	3	251	278	206	1,255,000
	Calf 361 Thoracic Glands	$\frac{1}{2}$	3	768·3	822	735	307,333
H 9. C. T.	G.P. 1033 from Calf 183	$\frac{1}{20}$	3	1,968	2,049	1,863	7,872,000
	Calf 185 Prescapular Gland	$\frac{1}{2}$	3	970·6	1,048	878	388,266
	Calf 331 Prescapular Gland	–	3	2,280	2,468	2,064	456,000
H 10. B. S.	Calf 35 Prescapular Gland	$\frac{1}{2}$	3	647·3	724	604	258,933
	Heifer 81 Prescapular Gland	–	6	2·5	5	0	500
	Calf 113 Prescapular Gland	$\frac{1}{2}$	3	451·3	536	365	180,533

Details of Estimations—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 10. B. S.	Calf 199 Prescapular Gland	–	3	994	1,085	867	198,800
H 11. E. D.	Calf 137 Local Lesion	$\frac{1}{2}$	3	280	320	245	112,000
	G.Ps. 916–9 from Calf 221	$\frac{1}{200}$	3	599·6	668	565	23,986,666
	Calf 309 Mesenteric Glands	$\frac{1}{2}$	3	2,746·6	2,864	2,651	1,098,666
H 12. H. N.	Original Material Human Mesenteric Glands	$\frac{1}{2}$	3	3·3	4	2	1,333
	Calf 123 Prescapular Gland	–	3	1,383·3	1,428	1,310	276,666
	Calf 135 Prescapular Gland	–	3	155	187	134	31,000
	G.Ps. 985–8 from Calf 189	$\frac{1}{20}$	3	1,444	1,626	1,293	5,776,000
	Calf 319 Thoracic Glands	$\frac{1}{100}$	3	3,925·3	4,266	3,638	78,506,666
H 13. A. D.	Original Material Human Bronchial Glands and Spleen	–	4	8	18	0	1,600
	Calf 119 Prescapular Gland	–	3	1,703·6	1,969	1,514	340,733
	G.Ps. 905–7 from Calf 129	$\frac{1}{200}$	3	676·6	761	626	27,066,666
	Calf 301 Thoracic Glands	$\frac{1}{50}$	3	2,488·3	2,586	2,325	24,883,333
H 14. F.S.	Original Material Human Mesenteric Glands	$\frac{1}{100}$	3	1,812·6	2,044	1,565	36,253,333
	Calf 121 Prescapular Gland.	$\frac{1}{10}$	4	4,283·75	5,304	2,850	8,567,500

DETAILS OF ESTIMATIONS—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 14. F. S.	Calf 125 Prescapular Gland	1/10	3	475	537	436	950,000
	Heifer 197 Prescapular Gland	½	3	1,129·3	1,295	1,006	451,733
H 15. I.W.	G.Ps. 599–602. from Original Material Human Ankle Joint	–	3	1,880·6	1,931	1,828	376,133
	Calf 193 Prescapular Gland	½	3	329	352	300	131,600
	G.P. 1053 from Calf 193	1/10	3	1,363·3	1,618	951	2,726,666
	G.Ps. 967–70 from Calf 195	1/20	3	1,870	2,118	1,603	7,481,333
	Calf 367 Prescapular Gland	–	3	1,930·6	2,006	1,800	386,133
	Calf 367 Local Lesion	1/10	3	4,508·3	4,609	4,438	9,016,666
	Calf 409 Liver	1/20	3	1,141·3	1,190	1,092	4,565,333
H 16. J.H.	Original Material Human Knee Joint	–	3	2	4	0	400
	Calf 155 Local Lesion and Prescapular Gland	–	5	178·2	358	57	35,640
	Calf 157 Prescapular Gland	½	3	750·6	794	714	300,266
	Calf 187 Local Lesion and Prescapular Gland	½	3	1,090·3	1,131	1,068	436,133
	Calf 273 Prescapular Gland	–	3	765·6	781	741	153,133
	Calf 355 Prescapular Gland	1/5	3	4,210·6	4,364	4,117	4,210,666

DETAILS OF ESTIMATIONS—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films. Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 16. J. H.	Rabbit 66 from Calf 355	$\frac{1}{10}$	3	3,931·6	4,047	3,832	7,863,333
	Calf 527 Local Lesion and Prescapular Gland.	$\frac{1}{200}$	2	2,092	2,132	2,052	83,680,000
	Calf 631 Prescapular Glands.	–	2	2,415	2,460	2,370	483,000
H 17. Sp.B.	Calf 161 Mesenteric and Pharyngeal Gland.	–	3	16·6	21	13	3,333
	G.P.s 1132–3 from Calf 167.	$\frac{1}{20}$	4	520	644	467	2,080,000
	G.P. 1023 from Calf 169.	$\frac{1}{10}$	3	2,369·3	2,716	2,163	4,738,666
	Calf 171 Mesenteric Gland.	–	3	19	25	13	3,800
	Calf 277 Prescapular Gland.	–	3	175	199	149	35,000
	G.P. 1235 from Calf 339.	$\frac{1}{20}$	2	1,303	1,321	1,285	5,212,000
	Calf 391 Local Lesion and Prescapular Gland.	$\frac{1}{20}$	3	1,705·6	1,737	1,652	6,822,666
	Calf 475 Lung.	$\frac{1}{200}$	2	1,043·5	1,060	1,027	41,740,000
	Calf 529 Thoracic Glands.	$\frac{1}{500}$	2	198	208	188	19,800,000
	Calf 531 Bronchial Gland.	$\frac{1}{100}$	2	306	311	301	6,120,000
	Calf 539 Lung.	$\frac{1}{200}$	2	5,106	5,356	4,856	204,240,000
	Calf 553 Thoracic Glands.	$\frac{1}{200}$	2	1,881·5	2,028	1,735	75,260,000

Details of Estimations—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 17. Sp. B.	Calf 557 Thoracic Glands	$\frac{1}{200}$	2	973·5	996	951	38,940,000
	Goat 39 Prescapular Gland	$\frac{1}{2}$	3	533·6	604	452	213,466
H 18. T.T.	Original Material Human Mesenteric Glands	–	3	1,119·6	1,217	986	223,933
	G.P. 1173 from Calf 131	$\frac{1}{50}$	3	1,079·6	1,119	1,037	10,796,666
	Calf 165 Prescapular Gland	$\frac{1}{2}$	3	949·3	1,005	902	379,733
	Calf 405 Local Lesion and Prescapular Gland	$\frac{1}{100}$	3	2,814	2,856	2,764	56,280,000
H 19. S.W.	Original Material Human Mesenteric Glands	–	3	773	784	766	154,600
	Calf 159 Prescapular Gland	$\frac{1}{2}$	3	277·3	327	233	110,933
	Calf 179 Prescapular Gland	$\frac{1}{2}$	3	1,984·6	2,068	1,939	793,866
	Calf 271 Prescapular Gland	$\frac{1}{10}$	3	2,672	3,204	2,245	5,344,000
H 20. F.L.	Original Material Human Mesenteric Glands	$\frac{1}{2}$	3	575·3	611	539	230,133
	Calf 213 Prescapular Gland	–	3	1,689	1,796	1,626	337,800
	G.P.s. 1153–4 from Calf 223	$\frac{1}{300}$	3	1,915	2,002	1,800	114,900,000
	Rabbit 87 from G.P.s. 1153–4	$\frac{1}{600}$	3	3,805·3	4,019	3,685	456,639,999
	Heifer 253 Prescapular Gland	$\frac{1}{50}$	3	6,304	6,429	6,233	63,046,666

DETAILS OF ESTIMATIONS—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 21. G.B.	Original Material Human Bronchial Glands	–	3	78·3	89	64	15,666
	G.Ps. 1236–7 from Calf 279	1/600	3	1,999	2,120	1,890	239,880,000
H 22. F.W.	Original Material Human Thoracic Gland	1/2	3	30·3	35	24	12,133
	Original Material Human Lung	1/2	3	1,426·3	1,491	1,319	570,533
	G.P. 1200 from Calf 291	1/100	3	1,799·3	1,816	1,784	35,986,666
	Calf 293 Prescapular and Prepectoral Glands	–	3	534	615	492	106,800
	Calf 399 Thoracic Glands	1/100	3	673	745	626	13,460,000
	Calf 457 Bronchial Gland	1/10	2	1,115	1,135	1,095	2,230,000
	Calf 749 Thoracic Gland	1/50	2	4,870	4,884	4,856	48,700,000
	Calf 811 Perivascular Tumour	1/400	2	464	517	411	37,120,000
H 23. J.P.	Original Material Human Lung	1/20	3	2,577·3	2,665	2,514	10,309,333
	Calf 345 Prescapular Gland	1/2	3	1,669·6	1,735	1,624	667,866
	Calf 365 Prescapular Gland	1/2	3	2,041·6	2,069	1,996	816,666
H 24. A.B.	Original Material Human Mesenteric Gland	–	3	873·6	910	844	174,733
H 25. A.T.	Original Material Human Lung	1/100	3	2,645·6	2,734	2,496	52,913,333

DETAILS OF ESTIMATIONS—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average	Highest Number in any one Film.	Lowest Number in any one Film.	
H 25. A.T.	G.P. 1282 from Original Material	1/100	3	229·6	251	215	4,593,333
	Calf 449 Prepectoral Gland	1/2	2	2,812	2,868	2,756	1,124,800
	Bull 551 Thoracic Gland	1/200	2	2,082·5	2,145	2,020	83,300,000
	Calf 831 Bronchial Gland	1/200	2	2,222·5	2,322	2,123	88,900,000
	Calf 859 Thoracic Gland	1/40	2	3,705·5	3,763	3,648	29,644,000
H 26. K.M.	Original Material Human Kidney	1/2	3	1,234	1,269	1,190	493,600
	G.P. 1386 from Original Material	1/500	3	5,051·3	6,102	4,347	505,133,333
H 27. B.D.	G.Ps. 1216–9 from Original Material Human Cervical Glands	1/20	2	1,024	1,028	1,020	4,096,000
H 28. C.L.	G.Ps. 1270–1 from Original Material Human Cervical Glands	1/100	3	2,253·6	2,280	2,210	45,073,333
	Cow 143 Milk	1/5	2	55·5	58	53	55,500
	Calf 515 Prepectoral and Cervical Glands	1/50	2	1,901·5	1,955	1,848	19,015,000
H 29. M.F.	G.Ps. 1328–9 from Original Material Human Cervical Glands	1/600	2	1,258·5	1,295	1,222	151,020,000
	Calf 479 Prescapular, Prepectoral and Cervical Glands	1/200	2	3,555·5	3,657	3,454	142,220,000
H 30. E.M.	G.Ps. 1336–9 from Original Material Human Mesenteric and Bronchial Glands	1/400	2	1,982	2,157	1,807	158,560,000
H 31. L.F.	Original Material Human Cervical Glands	1/2	2	996·5	1,055	938	398,600

Details of Estimations—*continued.*

Source of Emulsion or Milk.		Dilution of Sample before Counting.	Number of Films Counted.	Number of Tubercle Bacilli per Film.			Estimated Number of Tubercle Bacilli per cc. in the Undiluted Material.
Virus.	Nature of Material.			Average.	Highest Number in any one Film.	Lowest Number in any one Film.	
H 32. Y.W.	Original Material Human Lung	$\frac{1}{200}$	2	1,258	1,325	1,191	50,320,000
	Original Material Human Mesenteric Glands	$\frac{1}{100}$	2	2,935·5	3,203	2,848	58,710,000
	Calf 487 Prescapular Gland	$\frac{1}{50}$	2	3,103	3,193	3,012	31,030,000
H 36. M.D.	Original Material Human Bronchial Glands	$\frac{1}{5}$	2	1,039	1,059	1,019	1,039,000
H 10 B.S. + H 8 S.C.	Calf 689 Lung	$\frac{1}{20}$	2	2,510	2,553	2,467	10,040,000

Arthur Eastwood.

BOVINE VIRUSES.

TABLE OF ORIGINS.

VIRUSES OF BOVINE ORIGIN.

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	General Results.			
						Classification of Culture.	Virulence for		
							Bovines.	Rabbits.	Guinea-pigs.
B I.	Royal Veterinary College	May 6, 1902	The material was taken from a cow with extensive tuberculosis of the lungs and thoracic glands.	Gland and Lung	32 Bovines 20 Pigs 11 Baboons 13 Rhesus Monkeys 2 Cats 1 Orang	Class I.	High	High	High
B. II.	Royal Veterinary College	May 16, 1902	Cow with tuberculosis of the lungs and thoracic glands; the glands were large and caseo-calcareous.	Lung and Glands	17 Bovines 2 Goats	Class II.	High	High	High
B. III.	Royal Veterinary College	June 16, 1903	Cow with pulmonary and abdominal tuberculosis. The mediastinal and bronchial glands were very large and their substance was almost entirely replaced by yellow caseo-calcareous material.	Mediastinal Gland and Bronchial Gland	7 Bovines 3 Monkeys 4 Cats	Class I.	High	High	High
B. IV.	Royal Veterinary College	July 29, 1903	The glands were obtained from a cow which had lesions of the pharyngeal glands and foci of tuberculous broncho-pneumonia in the lungs. The mesenteric glands were slightly enlarged and contained caseo-calcareous masses.	Mesenteric Glands	19 Bovines 20 Pigs 8 Goats 9 Rhesus Monkeys 12 Cats 17 Dogs 12 Baboons 6 Chimpanzees 8 Hedgehogs	Class I.	High	High	High
B. V.	Royal Veterinary College	November 19, 1903	Cow, when killed, was found to have disease of the lung and mesenteric glands. A piece of the lung had on its surface two large growths containing in the interior yellow gritty foci. and showed in the substance under the pleura patches of tuberculous pneumonia.	Mesenteric Glands	9 Bovines 2 Goats 3 Dogs 1 Fowl	Class III.	High	High	High
B. VI.	Royal Veterinary College.	May 24, 1904	The specimen sent was an enlarged mediastinal gland from a cow. The gland consisted throughout of dense yellow caseated tissue, gritty on section.	Mediastinal Gland	4 Bovines 2 Pigs	Class I.	High	High	High

B. VII.	Royal Veterinary College	May 24, 1904	Several tuberculous mesenteric glands were sent. One large gland was entirely caseous and softened. The others contained caseous nodules of various sizes which were either soft in the centre or gritty on section.	Mesenteric Gland	2 Calves	Class II.	High	High	High
B. VIII.	Royal Veterinary College	May 24, 1904	The specimen sent was an enlarged mesenteric gland from an adult bovine; the gland was entirely caseous, softened, and slightly gritty.	Mesenteric Gland	2 Calves	Class III.	High	High	High
B. IX.	Metropolitan Cattle Market	June 21, 1904	The specimens were taken from a cow apparently in good health when killed. The carcass was in good condition. The lung showed slight evidence of tuberculosis, mainly pleural. The mesenteric glands contained highly calcareous irregular nodules. A mediastinal gland was greatly enlarged and showed one caseous gritty mass and numerous large yellow nodules. The iliac glands were affected.	Mediastinal Gland	7 Calves 2 Chimpanzees 4 Lemurs 2 Goats 6 Pigs 9 Monkeys 4 Baboons 6 Hedgehogs 6 Mongooses 10 Dogs 5 Cats 1 Fowl	Class III.	High	High	High
B. X.	Metropolitan Cattle Market	June 23, 1904	The specimens were obtained from a calf which before being killed appeared healthy and well-nourished. The autopsy revealed tuberculosis of the peritoneum, particularly on the diaphragm, of the pleura, of the lungs and spleen (only slight), and of all the lymphatic glands. The mesenteric glands, from which the culture used for experiment was derived, were not obviously enlarged but contained yellow calcareous nodules.	Mesenteric Glands	2 Calves 1 Dog	Class III.	High	High	High
B. XI.	Metropolitan Cattle Market	July 12, 1904	The mediastinal glands of an adult cow were slightly enlarged and showed beneath their capsules yellow nodules and internally yellow caseous gritty masses with foci of softening. The left bronchial gland was affected. Lungs and all other organs and glands were normal.	Mediastinal Glands	2 Calves	Class III.	High	High	High
B. XII.	Metropolitan Cattle Market	July 28, 1904	The specimens were taken from a bullock in good condition and only two tuberculous foci were found in the whole body. One was a nodule in the lung, the size of a pigeon's egg, filled with yellow caseo-pus. The other was a very enlarged mediastinal gland which was packed with yellow gritty tubercles and contained a cavity filled with gritty caseo-pus.	Mediastinal Gland. Lung	2 Calves	Class I.	High	High	High

VIRUSES OF BOVINE ORIGIN—*continued.*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	General Results.			
						Classification of Culture.	Virulence for Bovines.	Virulence for Rabbits.	Virulence for Guinea-pigs.
B. XIII.	Metropolitan Cattle Market	September 25, 1904	One tuberculous mediastinal gland was taken from a four months old calf which had no other sign of tubercle. The glands, slightly enlarged, showed yellow points beneath the capsule, and internally discrete tubercles with yellow gritty centres.	Mediastinal Gland	2 calves	Class I.	High	High	High
B. XIV.	Metropolitan Cattle Market	September 27, 1904	The pleura was taken from an aged cow which had lungs pleura and thoracic glands affected. The specimen consisted of typical 'grapy' masses, in parts two inches thick, composedof firm translucent fibroid tissue thickly sown with gritty yellow areas of necrosis.	Pleura	2 calves	Class I.	High	High	High
B. XV.	Metropolitan Cattle Market	November 14, 1904	A mesenteric and mediastinal gland were sent. They came from a young cow which had, in addition, a small patch of tubercle in the right lung. The mediastinal glands were not enlarged but contained scattered yellow tubercles. The mesenteric gland showed in the centre a large irregular yellow mass and a few scattered tubercles.	Mesenteric Gland and Mediastinal Glands	2 calves	Class I.	High	High	High
B. XVI.	Metropolitan Cattle Market	December 20, 1904	A young fattened cow, when killed, was found to have bronchial and mediastinal glands affected and no sign of tubercle elsewhere. The specimens sent were (1) a large mediastinal gland which contained a hard fibroid and highly calcareous nodule, and (2) a small gland which had a few discrete very chronic tubercles.	Mediastinal Gland	2 calves	Class I.	High	High	High
B. XVII.	Metropolitan Cattle Market	January 9, 1905.	The specimens, mediastinal and bronchial glands and lung, were taken from a young fat cow. In the lung were two patches of tubercle. There were no tubercles in the bronchial glands. The patches in the lung were tuberculous and showed yellow patches of necrosis. In the mediastinal gland there were two nodules, filled with softened caseous material gritty from calcification, and numerous discrete yellow pea-sized calcareous nodules.	Lung and Mediastinal Glands	1 calf	Class I.	High	High	High

B. XVIII.	Metropolitan Cattle Market.	January 30, 1905	The specimens were the bronchial glands of a young cow. The left lung showed a few patches of tubercle; there was no trace of tuberculosis of pleura or of any other organs or glands. The two bronchial glands were beset with yellow caseous nodules, slightly gritty from calcification, which almost completely replaced the gland substance.	Bronchial Gland	5 Calves 2 Cats	Class I.	High	High	High
B. XIX.	Metropolitan Cattle Market.	March 27, 1905	The specimens were the bronchial glands from a cow, aged 4 years, which had slight tuberculosis of one lung. The glands, little if at all enlarged, contained firm creamy white caseous nodules, each about the size of a pea. They were very slightly gritty and were arranged chiefly in groups.	Bronchial Gland	1 Calf	Class I.	—	High	High
B. XX.	Metropolitan Cattle Market.	March 27, 1905	The bronchial and mediastinal glands were taken from a young healthy looking bull, three to four years old. There was no sign of tubercle elsewhere. The glands contained discrete pea-sized yellow caseo-calcareous nodules and one or two larger softened caseous masses, slightly gritty from calcification.	Mediastinal Gland	Rabbits and Guinea Pigs only	Class II.	—	High	High
B. XXI.	Metropolitan Cattle Market.	April 18, 1905	The specimens, bronchial glands, were taken from a young cow which showed no sign of tuberculosis elsewhere. The gland on section showed firm yellow caseous nodules, not perceptibly gritty.	Bronchial Gland	Rabbits and Guinea Pigs 2 Hedgehogs	Class I.	—	High	High
B. XXII.	Metropolitan Cattle Market.	April 18, 1905	A pectoral and one sub-dorsal (?) gland were taken from a young heifer which showed slight tuberculosis also of the lungs. In both the glands, which were not apparently enlarged, there were yellowish necrotic streaks and foci; one or two calcareous particles were seen but no definite caseation.	The two lymphatic Glands	2 Dogs, Rabbits, Guinea Pigs	Class II.	—	High	High
B. XXIII.	Metropolitan Cattle Market.	May 11, 1905	The specimens, a piece of lung and the mediastinal glands, were removed from a young cow which showed no sign of disease elsewhere. The piece of lung contained a solid mass $2 \times 2 \times 1\frac{1}{2}$ composed of softened caseous nodules bound together by fibrous tissue. The mediastinal glands contained numerous yellow gritty nodules, mostly about the size of peas, but some that of kidney beans; the latter were softened.	Lung	2 Calves	Class II.	High	High	High

VIRUSES OF BOVINE ORIGIN—*continued.*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for experiment.	Animals Inoculated.	General Results.			
						Classification of Culture.	Virulence for		
							Bovines.	Rabbits.	Guinea-pigs.
B. XXIV.	Metropolitan Cattle Market.	May 18, 1905	Lung and bronchial and mediastinal glands from young cow. On the surface of the lung there was a prominent "grapy" growth; the tissue of the lung contained scattered fibroid nodules, largest the size of a pea, showing slight central necrosis. The glands were but slightly affected; three contained each a large pea-sized fibroid nodule with a yellow network of necrosis in the centre; the two larger glands showed a few yellow discrete foci.	Lung	2 Calves 2 Dogs	Class I.	High	High	High
B. XXV.	Metropolitan Cattle Market.	June 26, 1905	The specimens, portions of the lung and pleura, were taken from a young cow which showed no signs of disease elsewhere. Both the pleura and the lung showed on the surface firm pinkish translucent "mushroomed" growths containing yellow foci of necrosis; the tissue of the lung appeared normal.	A pleural Growth	Rabbits and Guinea Pigs only	Class III.	—	High	High
B. XXVI.	Metropolitan Cattle Market.	August 1, 1905	The specimen sent was the bronchial gland of a bull, 2 years old; the lungs were affected in places; there was no disease elsewhere. The gland measured 3¼ × 2½ × 1¼ and, with the exception of a few islands of fibrous tissue, was composed throughout of yellow caseo-calcareous material breaking down in the centre of the gland.	Bronchial Gland	2 Calves 4 Monkeys 3 Fowls	Class I.	—	High	High
B. XXVII.	Metropolitan Cattle Market.	September 1, 1905	The specimens were taken from a calf about four months old which was considered by Mr. King to be suffering from congenital tuberculosis. The peritoneal surface of the diaphragm was covered with firm flattened growths 8 to 9 mm. thick, composed of dense translucent tissue, showing in the centre yellow, gritty foci. There were numerous small "perlsucht" growths on the surface of the spleen and a few grey miliary tubercles in the pulp, some with opaque centres. The lung substance and the liver substance were normal; each showed on the surface growths similar to those on the diaphragm. An enlarged mediastinal gland was beset in the cortex with small irregular yellow gritty foci. An iliac gland was normal.	Diaphragm	Rabbits and Guinea Pigs only	Class III.	—	High	High

B. XXVIII.	Butcher's Meat	January 15, 1906	The material, a tuberculous lymphatic gland, was taken from a mass of fat supplied with a joint of beef to one of the laboratory assistants. Two tuberculous glands were found in the fat ; one contained a small calcareous tubercle ; the other some rather larger calcareous nodules ; the culture used for experiment was raised from the former.	? Thoracic Gland	5 Pigs 5 Cats	Class III.		High	High
B. XXIX.	Metropolitan Cattle Market	February 12, 1906	Bronchial and mediastinal glands from a young cow in good condition. Two of the mediastinal glands were slightly enlarged and composed throughout of a brownish translucent tissue, containing a yellow necrotic network ; in the middle of one of these glands there was a calcareous mass, the size of a split pea, which easily shelled out. The bronchial glands were normal and there was no sign of tubercle elsewhere in the body.	Mediastinal Gland	Rabbits and Guinea Pigs only	Class II.		High	High
B. XXX.	Metropolitan Cattle Market	March 30, 1906	The specimens, pieces of omentum and lung, some mesenteric glands, an inguinal and a bronchial gland, were taken from a calf, four months old, which was killed on March 29, 1906. On the omentum there were numerous firm nodules, mostly about the size of peas, composed of firm translucent tissue, containing a yellow caseous network, gritty from calcification. One of the mesenteric glands was irregularly caseated and gritty from calcification. The inguinal gland was enlarged, and on section showed part of its substance irregularly caseous and gritty, while the rest was studded with yellow foci, mostly gritty. The piece of lung contained scattered nodules, up to 4 or 5 mm. in diameter, with yellow calcareous centres. The bronchial gland, not much enlarged, showed a calcareous patch and irregular caseo-necrotic foci, some gritty, forming in places a network. The post-mortem examination also showed tuberculosis of the pleura, liver, spleen, and penis.	Bronchial Gland	Rabbits and Guinea Pigs only	Class II.		High	High

INOCULATION EXPERIMENTS.

ABBREVIATIONS USED IN THE TABLES.

T.	Tuberculosis.
G.T.	General Tuberculosis.
S.T.	Slight Tuberculosis.
No T.	No Tuberculosis.
D.	Died.
K.	Killed (when in good health, except when otherwise mentioned).
G.P.	Guinea-pig.
T.B.	Tubercle Bacilli.
S. and Subcut.	Subcutaneous.
I. and Intrap.	Intraperitoneal.
L.F.	Left fore (quarter of udder).
R.H.	Right hind (quarter of udder).
E.	Emulsion.

INTRODUCTION.

Inoculation experiments with tubercle bacilli of bovine origin have been made

(1) To supply a basis of comparison for experiments with tubercle bacilli of human origin;

(2) To determine the range of variation in the virulence of different strains of tubercle bacilli isolated from the bovine;

(3) To test the susceptibility of different species of animals to the bovine tubercle bacillus.

MATERIAL USED IN THE INVESTIGATION.

Tuberculous material has been obtained from thirty different bovines. The animals from which the material was taken were naturally infected with tuberculosis, infection in the majority of the cases having originated in the thorax, in some through the alimentary canal, and in one case probably congenitally.

The cases are representative of the ordinary forms of natural tuberculosis met with in the ox, and include cases of severe general tuberculosis, slight general tuberculosis, and tuberculosis limited to certain glands; the latter were specially selected on account of the localisation of the disease in the hope that in such lesions bacilli of lower virulence than those, *e.g.*, obtained from an animal with severe generalised tuberculosis, would be obtained.

Inoculation experiments have been made with the fresh, or original, material as well as with cultures derived from that material.

The cultures were obtained either direct from the original material or from one of the animals inoculated with the virus, usually the guinea-pig; except in one instance all the cultures have been grown on pure serum, that of the ox being most frequently employed.

The different viruses are designated by the letter B and a Roman numeral.

SPECIES OF ANIMALS INOCULATED.

Fifteen different species of animals have been inoculated, namely, the ox, the goat, the pig, the chimpanzee, the monkey (*Macacus rhesus*), the baboon (*Papio porcarius*), the lemur, the dog, the cat, the rabbit, the guinea-pig, the hedgehog, the mongoose, the rat and the mouse.

METHODS OF INOCULATION.

The methods of inoculation employed have been the intravenous, intraperitoneal, intramammary and subcutaneous. Intramammary inoculation was practised on cows only, chiefly with the special object of producing a supply of tuberculous milk for feeding experiments.

ESTIMATION OF DOSES.

In the early part of the work the number of tubercle bacilli present in the emulsions used for inoculation was not estimated; in all the later experiments an estimate of the number of bacilli in the emulsions was made by Dr. Eastwood.

The culture doses have always been estimated volumetrically in the following way:—

The growth from the surface of each serum tube is scraped off with a platinum spatula and emulsified with a small amount of sterile salt solution between sterilised ground glass plates; the thick resulting emulsion is diluted on the plate with more saline and run into a sterile test tube; when all the growths have been dealt with in this manner, the emulsion is vigorously shaken and put on one side for about an hour to allow all the larger unbroken masses to settle. The supernatant fluid is then decanted into a separate test tube and four accurately graduated capillary tubes are immediately filled from it. The tubes, after being sealed at both ends, are centrifugalised until all the culture has accumulated at the bottom of each tube in the form of a small column. The length of the column of bacilli and that of the combined columns of bacilli and fluid are then in each case carefully measured with a lens and a millimetre scale: the average is taken and expressed as a ratio.

Having determined the relative volumes of bacilli and fluid in the emulsion, the amount of emulsion necessary for a given dose can be readily calculated; for example, if a dose of 10 milligrammes is required and the emulsion contains 1 volume of bacilli in 40, 0·4 cubic centimetre is taken; for a dose of 1 milligramme 0·4 cubic centimetre is diluted to 10 cubic centimetres and 1 cubic centimetre of the dilution inoculated; or for a dose of 0·001 milligramme 1 cubic centimetre of the latter dilution, equivalent to 1 milligramme of culture, is diluted to 1,000 cubic centimetres and 1 cubic centimetre inoculated; and so on for smaller doses.

The doses are expressed in milligrammes, but in reality cubic millimetres would be more correct. The method, however, gives a result which is in close agreement with that given by the gravimetric method as was shown in one case in which the culture was first weighed and then estimated by the volumetric method.

INOCULATION EXPERIMENTS WITH THE OX.

INOCULATION EXPERIMENTS WITH THE OX.

Inoculation experiments with emulsions of tuberculous tissues have been made with the first five viruses only (B. I., B. II., B. III., B. IV. and B. V.).

Four of these viruses were emulsified and inoculated direct into bovines, other bovines being subsequently inoculated from the tissues of one of the first experimental animals.

In the case of Virus B. I. the original material was inoculated into a series of twenty-four guinea-pigs, and from eight of these an emulsion was made which was inoculated into Cow 18 and Heifers 8 and 24. From one of the other guinea-pigs (No. 14), inoculated with the original material of Virus B. I., a culture was isolated, and, when it was 57 days old, inoculated into Cow 40 and Heifers 10 and 12; the virus subsequently was carried on from the cow through a long series of bovines, each animal being inoculated with the tuberculous tissues of the one immediately preceding; the virus from Cow 40 was passed also through a series of pigs, and, from the tuberculous lesions produced in two of these, calves (four altogether) were inoculated subcutaneously.

The virulence of the other viruses, which have been inoculated into bovines, has been estimated by means of cultures only. Cultures from the first five viruses have also been inoculated into bovines.

The total age of the cultures has varied from 73 to 642 days, but the subcultures inoculated have generally been about three weeks old.

The experimental results are considered under the different modes of inoculation.

INTRAVENOUS INOCULATIONS.

The animals, four in number, inoculated intravenously have all been adult heifers.

Two, inoculated with the emulsion of the tuberculous organs of the guinea-pigs (Virus B. I.), developed an acute miliary tuberculosis of the lungs, one dying in 18 days, the other having to be killed when ill 25 days after inoculation.

One of the other heifers was inoculated with an emulsion made from the udder of Cow 40. This animal remained well and was killed in good health 115 days after inoculation; the lungs contained a large caseating mass and some small caseous nodules, and the thoracic glands caseo-calcareous nodules; there was no disease elsewhere. A heifer (No. 30) inoculated subcutaneously with an equivalent dose of the same emulsion was much more severely affected.

The remaining heifer (No. 10), was inoculated intravenously with 5 cc. of the emulsion of culture used to inoculate Cow 40; it became ill and was killed on the 37th day; the lungs and thoracic glands were packed with miliary tubercles, and there were a few small tubercles in the liver, spleen and kidneys.

INTRAPERITONEAL INOCULATIONS.

One calf was inoculated intraperitoneally with an emulsion containing 205,300 tubercle bacilli (Virus B. II.), made from the local lesion and prescapular gland of Heifer 66; it was killed 188 days after and showed chronic tuberculous peritonitis, caseo-calcareous tuberculosis of some of the abdominal and thoracic lymphatic glands and one loosely pedunculated body on the pleura. A calf inoculated at the same time, and with an equivalent dose of the emulsion, developed a local lesion only.

INTRAMAMMARY INOCULATIONS.

Nine cows have been inoculated, each in two quarters of the udder, with emulsions of tuberculous tissues, and one with culture. Seven of the animals inoculated with tissue emulsions died or were killed when very ill in periods varying from 32 to 48 days. They became ill very soon after inoculation, the illness running a very characteristic course (*see, e.g.*, Cow 4, page 120); the inoculated quarters and nearest glands underwent very great enlargement.

On post-mortem examination the disease in four of the animals had not extended beyond the nearest glands; in the others there was early tuberculosis in the internal organs.

One of the other cows (No. 74) died 297 days after inoculation; she had remained well until within a few weeks of her death; on post-mortem examination, besides chronic tuberculosis of the udder and nearest glands, very extensive tuberculosis of the lungs, thoracic and mesenteric glands and the tonsils was found; the lesions, and the milk which was withdrawn from the udder after her death, were swarming with tubercle bacilli.

This cow was tested with tuberculin three times during the experiment and on each occasion there was a local reaction but no rise of temperature.

The remaining cow (No. 172) was killed in good health 399 days after she was inoculated; the udder and nearest glands showed chronic tuberculosis and there was one tubercle in each suprarenal body.

This cow was inoculated with an emulsion made from the local lesion and prescapular gland of Calf 138 (Virus B. IV.) and received approximately the same number of tubercle bacilli (*i.e.* 14·67 million) as Cow 164, which was inoculated with an emulsion of the tuberculous organs of guinea-pigs, inoculated at the same time and with some of the same emulsion as Cow 172. Cow 164 was killed in a dying condition 47 days after inoculation, and showed extensive tuberculosis of the udder and nearest glands and early general tuberculosis.

Other examples could be given of a virus taken direct from calcareous and retrogressive bovine lesions producing very much less effect than the same virus after it has been passed through the body of the guinea-pig, although in each case the number of bacilli inoculated has been the same.

The cow (No. 40), inoculated with culture (dose not estimated but probably very small), was killed when well 92 days after inoculation; the udder and neighbouring glands were very large and extensively tuberculous, and there were numerous tubercles in the lungs and two small nodules in a bronchial gland. The virus from this cow was subsequently passed through a long series of bovines. (*See* Table I A).

SUBCUTANEOUS INOCULATIONS.

Calves Inoculated with Tissue Emulsions.

Twenty three calves have been inoculated subcutaneously with emulsions of tuberculous tissues, the doses of bacilli varying from 542 million to so small a number that none could be demonstrated after prolonged microscopic search. Five of the calves died or were killed when dying in periods varying from 35 to 71 days and showed severe generalised tuberculosis. Another, a much older animal than the others, inoculated with the largest dose, was killed when ill 160 days after inoculation and found to be suffering from slowly progressing general tuberculosis. The other animals remained well and were killed in periods varying from 78 to 202 days; in one there was a local lesion only; in others slowly progressing general tuberculosis and between these tuberculosis of every intermediate degree of severity.

The calf in which a local lesion only was found was inoculated with an emulsion made from the prescapular gland of Heifer 66 (Virus B. II.) the dose of tubercle bacilli being 205 thousand. The heifer from which the emulsion was made although inoculated with a smaller number of tubercle bacilli (1330) than the calf, taken from older and more calcareous lesions, developed a mild form of general tuberculosis.

The result in Calf 134, therefore, seemed to indicate that the virus, during its residence in Heifer 66, had undergone some diminution in virulence. In order to ascertain whether this were the case or not, 50 milligrammes of the culture which had been isolated direct from the local lesion of Calf 134 were inoculated into a calf, with the object of comparing the effect produced by it with that produced in another calf by 50 milligrammes of the culture isolated from Heifer 66. The latter calf died in 26 days of a very acute miliary tuberculosis. The calf inoculated with culture from Calf 134 was killed after the same interval of time, when it was very ill, but not dying ; the post-mortem examination showed general miliary tuberculosis, but of a less severe type than that which resulted in the calf inoculated with culture from the heifer ; the difference, however, in the two animals was not greater than might have occurred if both had been inoculated with equal amounts of the same culture.

Rabbit experiments with the two cultures showed no decrease in virulence.

These results clearly demonstrate that the great majority of the tubercle bacilli in the emulsion made from the prescapular gland of Heifer 66 were either dead or dying.

That this was the case is I think further shown in two of the animals of the series inoculated with the virus from Calf 134 after it had been passed through two series of guinea-pigs.

Two of the guinea-pigs inoculated with the pus from the local lesion of Calf 134 were killed, and separate emulsions made from their tuberculous organs and glands. Equal amounts of each emulsion were inoculated intraperitoneally into two guinea-pigs, and, fourteen days later, from the four guinea-pigs thus inoculated an emulsion was made which was very rich in bacilli, a rapid count giving the high total of 235,740,000 per cubic centimetre.

With this emulsion four calves (including Calf 178 and Calf 158) and two goats were inoculated subcutaneously. (See Table, 2B.)

Calf 178 was inoculated with approximately the same number of tubercle bacilli as Calf 134 ; the post-mortem examination showed a local lesion, great enlargement, fibrosis and necrosis of the prescapular, prepectoral, thoracic and portal glands, and caseous nodules in all the organs (except the kidneys).

In Calf 158 inoculated with only 5,000 tubercle bacilli, the disease had spread from the prescapular gland to one of the thoracic glands.

The results, therefore, with tissue emulsions support the conclusion arrived at from the culture experiments—that the slight amount of disease in Calf 134 was due to lack of vitality in the bacilli inoculated and not to attenuation of the virus.

It might be said that Calf 134 was a specially resistant animal, but another calf inoculated intraperitoneally with an equal amount of the same emulsion showed tuberculosis which had extended only to the nearest glands, none of the organs being affected.

An Immunity Experiment.

One of the calves (No. 140) inoculated with a tissue emulsion was made the subject of an immunity experiment. This animal was inoculated subcutaneously, when fifteen and a half weeks old, with an emulsion made from the prescapular gland of Calf 120 (dose, 100,000 tubercle bacilli). From this inoculation the animal made apparently a complete recovery.

One hundred and fifty-nine days after the first inoculation the calf was re-inoculated subcutaneously with 25 milligrammes of culture from the original material of Virus B.IV.

The inoculation gave rise to phenomena, local œdema and high temperature, similar to, but of much greater severity than, those which follow the inoculation of tuberculin in a tuberculous animal. The calf completely recovered from this inoculation, whilst another calf inoculated with half the dose developed severe general tuberculosis. Subsequent inoculations of 50, 100 and 229 milligrammes of culture at intervals of 215, 481, and 566 days after the primary inoculation respectively, with the production in each case of nothing more than a local swelling and transient illness, demonstrated conclusively the high degree of immunity induced in this animal.

Calves inoculated with Culture.

Cultures from twenty-one different bovine viruses, have been inoculated into calves.

Fifty-three calves altogether have been inoculated thirty-five with 50 milligrammes, two with 25 milligrammes, twelve with 10 milligrammes, one with 5 milligrammes, and two with very small doses, *i.e.*, 0·01 and 0·02 milligrammes respectively.

Thirty-three of the calves inoculated with 50 milligrammes of culture (representing nineteen distinct viruses), died or were killed when dying, in periods varying from 18 to 76 days ; only one of these lived for 76 days, the duration of life in the other cases varying from 18 to 47 days ; of the remaining two, one was killed when ill, 14 days after inoculation (for dissemination of tubercle bacilli), the other, Calf 240, was killed in good health 54 days after inoculation. With the exception of the latter all the calves developed general progressive tuberculosis of a very severe type.

Calf 240 showed a small local abscess, tuberculosis of the nearest glands, fairly numerous, small tubercles in the lungs, and about thirty in the spleen.

The result in this calf was exceptional, and is the only instance in which the inoculation of 50 milligrammes of culture, has not been followed by general progressive tuberculosis.

Fifty milligrammes of the same culture, but of a later generation, inoculated into another calf, caused death from acute tuberculosis in 32 days. So that the most probable explanation of the mild type of disease in Calf 240 is that this animal was possessed of a high degree of resistance.

Two calves have been inoculated each with 25 milligrammes of culture (Viruses B VI. and X.) ; one with 12·5 (Virus B IV.), and one with 5·0 milligrammes (Virus B XVI.) ; all these animals were killed when ill 42 to 60 days after inoculation ; the calf which received 5·0 milligrammes was quite as severely affected as those which received 25 milligrammes.

Twelve calves have each been inoculated with 10 milligrammes of culture ; four were inoculated with culture from Virus B XVIII. and two with culture from each of the four viruses, B V., IX., XXIII., and XXIV. Eight of the calves died in periods varying from 33 to 53 days of acute generalised tuberculosis. The other four were killed after 90 days ; one was ill when killed and showed slowly progressing generalised tuberculosis ; the others were in good condition, and although there was tuberculosis disseminated all over the body the lesions had a definitely retrogressive character ; in one the tubercles were very minute and were comparable to those often produced in calves by bacilli of much lower virulence.

One of the two pairs of calves used for Virus B XVIII. was inoculated with a culture which had been grown for 209 days on glycerin media ; the other pair was inoculated with culture which, since isolation, had been grown on pure serum ; the calves inoculated with the glycerin cultures developed a much more severe type of disease than those inoculated with the serum cultures.

In the case of two viruses very small doses of culture were inoculated ; this was done in order to compare the activity of bacilli in cultures with that of bacilli in emulsions of tuberculous tissues.

Calf 202 was inoculated to compare with Calf 144 ; the former animal received 0·01 milligramme of culture, the latter 2·82 cubic centimetres, containing 4,500,000 tubercle bacilli of an emulsion made from the original material of Virus B V.

One milligramme of culture has been estimated to contain from 5,000 to 9,000 million tubercle bacilli, therefore Calf 202 received from 10 to 20 times as many bacilli as Calf 144.

In Calf 144, besides a local lesion and tuberculous adjacent glands, there were nodules in the liver, spleen, and lungs, and the thoracic, hepatic and cœliac glands were tuberculous.

In the calf inoculated with culture the disease had not extended beyond the nearest gland.

Calf 210 was inoculated to compare with Calves 108 and 112 ; all three showed slight general tuberculosis, and it is interesting to note that Calf 210 was not more severely affected than Calves 108 and 112, although it received many more bacilli than these animals.

Bacilli contained in emulsions of tuberculous tissues appear, therefore, to be more effective than bacilli which have been grown in pure culture.

ADULT BOVINES.

Inoculated with tissue Emulsions.

Nine adult bovines, three of which were shorthorns, have been inoculated subcutaneously with tissue emulsions. Two inoculated with an emulsion, dose not estimated but probably large, made from the original material of Virus B II., were killed when ill after 35 and 48 days and found to have general progressive tuberculosis.

None of the other animals became ill, and when killed in periods varying from 62 to 147 days had increased considerably in weight; in one the disease had not extended beyond the nearest glands; in another there were, besides a local lesion and a tuberculous prescapular gland, a few caseous nodules in the thoracic glands; all the others (excluding Heifer 28) had slight disseminated tuberculosis, in all cases apparently retrogressive.

Heifer 28 was inoculated subcutaneously with 11 cc. of an emulsion containing 116,660 tubercle bacilli, made from the precrural gland of Heifer 30; the inoculation was followed by a local oedema lasting seven to ten days, similar to that ordinarily seen in an animal reacting to tuberculin.

The post-mortem examination showed no trace of tuberculosis at the seat of inoculation, and only two small tubercles in the prescapular gland, whereas the two animals, a shorthorn heifer and a Jersey calf, inoculated at the same time and with equivalent doses of the same emulsion developed good local lesions and large prescapular glands. In the thorax, however, there was well marked tuberculosis; the left lung contained a large caseous nodule and a few scattered tubercles; the left bronchial gland was greatly enlarged and caseous throughout; the mediastinal glands were also tuberculous; other organs and glands were normal.

The unusual distribution of the lesions in this animal, and their appearance, pointed to inhalation tuberculosis, and suggested a probable explanation of the absence of any local disease—that the animal had acquired during the progress of a natural infection a degree of immunity sufficient to destroy the small number of bacilli introduced experimentally under the skin.

ADULT BOVINES.

Inoculated with Culture.

Heifer 12 was inoculated subcutaneously with 5 cc. of the same emulsion of culture used to inoculate Heifer 10 and Cow 40. The animal remained well and was killed 95 days after inoculation; on post-mortem examination very little was found in this animal beyond the nearest glands.

Bull 88, when he was two years old, was inoculated at the same time and with the same dose of culture, *i.e.*, 50 milligrammes, as Calf 224. The calf died 42 days after inoculation of severe general tuberculosis, and the bull was killed after about the same interval of time in order to compare the extent and the severity of the disease in the two animals. It was found that both in extent of distribution and in the number of tubercles in individual organs and glands the disease was less severe in the bull than in the calf; many of the lymphatic glands in the former animal were unaffected, whereas those of the calf were all severely affected; moreover, the general health of the bull was scarcely altered, and smear preparations from its lesions showed tubercle bacilli to be very scanty.

Other experiments, with tissue emulsions, have also shown that the adult ox is very much more resistant to tuberculosis than the calf.

An Experiment to ascertain whether tubercle bacilli are excreted in the milk of a tuberculous cow with a normal udder.

The third adult animal, a cow in full milk, was rendered tuberculous with the object of ascertaining whether tubercle bacilli are excreted in the milk from a tuberculous cow with a normal udder.

The cow was inoculated subcutaneously, on September 2nd, 1905, with 100 mg. of culture obtained from Guinea-pig 1015 (Virus B. VI.) and her milk was used subsequently to inoculate forty guinea-pigs and to feed two pigs.

Before inoculation she was tested with tuberculin and her milk was inoculated into eight guinea-pigs, two from each quarter; in each test the result was negative.

After inoculation five series of eight guinea-pigs were inoculated, each with five cubic centimetres of milk, two from each quarter, at intervals of seven, sixteen, twenty-one, twenty-eight, and thirty days respectively.

Each of the two pigs was fed with milk for a week, one from the 16th to the 23rd, (*i.e.*, during the third week after the inoculation of the cow), the other from the 23rd to the 30th of September, no other food during these periods being given.

The cow died suddenly on October 2nd, 1905, 30 days after inoculation. The post-mortem examination showed death to be due to acute tuberculosis; the udder was normal to the naked eye.

Results of the Inoculation of the Milk:—Of the first series of guinea-pigs (*see* Table, page 228.) four died a short time after inoculation and showed no sign of tuberculosis. The remaining four were killed; one was healthy; the other three were tuberculous.

In the second series of guinea-pigs four died too early for the development of tuberculosis (in the local lesion of one tubercle bacilli were found). The other four were killed six weeks after inoculation; two were healthy and two tuberculous.

In the third series seven died and one was killed; of the former six were tuberculous, while the seventh died too soon for tuberculosis to develop; the guinea-pig that was killed was healthy.

In the fourth and fifth series all the guinea-pigs died; two in the latter series were eaten by their companions; the other showed tuberculosis, in no case very severe.

The two pigs were killed 82 and 75 days respectively after the commencement of the feeding and were found to be free from tuberculosis.

General Results:—The inoculation experiments show that the milk was capable of setting up tuberculosis in guinea-pigs at the end of the first week and on every subsequent occasion until the death of the cow. It may be concluded therefore that the milk of a tuberculous cow, without tuberculous disease of the udder, is liable to contain tubercle bacilli should tubercle bacilli ever gain access to the general circulation.

In this case, although the number of tubercle bacilli circulating in the blood stream was probably very large, larger than would ever be present in natural conditions, nevertheless only a small number of bacilli appear to have been excreted in the milk, as shown in the comparatively mild type of disease in most of the guinea-pigs inoculated and in the failure to infect pigs by feeding.

In a recent experiment, full details of which will be given in a subsequent Report, it has been shown that tubercle bacilli of human origin, possessed of slight virulence for the bovine, are excreted in the milk of a cow within 24 hours of their subcutaneous inoculation on the left side of the neck.

GENERAL DESCRIPTION OF THE EFFECTS PRODUCED IN THE BOVINE BY THE SUBCUTANEOUS INOCULATION OF THE BOVINE TUBERCLE BACILLUS.

When a calf is inoculated subcutaneously with 50 milligrammes of culture a lesion soon develops at the seat of inoculation; usually at the end of twenty-four hours there is appreciable thickening of the subcutaneous tissues; this gradually increases, and may finally grow into a tumour of considerable dimensions; when the tumour is very large there is usually considerable oedema around its lower part and also around the prescapular gland and in the dewlap, and the muscles between the tumour and nearest glands are often thickened and infiltrated. The skin over the tumour is hot and the surface frequently dry, scaly, and fissured, drops of serum exuding from the cracks; sometimes the skin over the tumour breaks down and a deep foul-smelling ulcer ultimately forms, which communicates with a cavity in the centre of the tumour.

The tumour, at first uniformly hard, towards the end of the experiment often has a softer doughy consistence in the thicker portion, or it may become uniformly softened and assume a globular shape.

The prescapular gland can generally be felt to be enlarged two or three days after inoculation; it progressively increases in size and finally forms a firm, egg-shaped tumour measuring 4 to 5 inches in length; it is generally moveable, but may be adherent to the tumour and the surrounding muscles.

Other lymphatic glands adjacent to the lesion, *e.g.*, the prepectoral and some of the cervical, are often felt to be enlarged during life.

The general condition of the animal usually remains unaltered during the first two or three weeks; the first sign of ill-health to appear is some roughening of the coat; then the animal begins to lose flesh; the respirations increase in frequency and the animal dies showing all the signs of an acute pneumonia; the respiratory troubles may be sudden in their onset or gradual. The temperature generally rises suddenly about the seventh to the eleventh day; sometimes the rise is more gradual or there may be a sudden rise after some preliminary fluctuations.

At the post-mortem examination the following appearances are seen: the local lesion is found to be composed of a subcutaneous mass of firm yellow caseo-necrotic tissue intimately adherent to and infiltrating the skin and muscles on either side; in the centre of the mass there is often a small cavity containing serous fluid and caseous flocculi, or there may be merely a series of small spaces filled with serous fluid; sometimes the greater part of the mass undergoes colliquative necrosis and a large cyst is formed lined internally with caseous substance, and filled with watery fluid containing caseous flakes.

The muscles under the tumour are infiltrated to a varying depth and are fibroid and closely beset with caseous nodules; lymphatic vessels between the local tumour and adjacent glands are frequently thickened and caseous, the infiltration often extending into the muscles around.

The two nearest glands, the prescapular and spherical prepectoral glands, are composed throughout of dense pinkish yellow homogeneous caseous substance which may, if the animal has lived some time, contain calcareous grains. Many of the cervical glands may wholly or in part resemble the prescapular.

The appearance of the lesions in the internal organs depends to a large extent upon the duration of life of the animal.

When the animal has lived a short time only all the organs contain typical miliary tubercles with caseous centres, always more numerous in the lungs, liver and spleen than in the kidneys; the tissue of the lungs is extensively consolidated, the cephalic, right middle and antero-ventral portions of the caudal lobes being dark red and often quite airless; the bronchi in these consolidated lobes become filled with muco-pus.

The thoracic, portal and coeliac glands are enlarged and show their cortices often uniformly tuberculous, but in a less advanced stage of caseation than the prescapular; all other lymphatic glands contain discrete caseating miliary tubercles, the renal and lumbar glands always containing more than the peripheral lymphatic glands. Tubercles are also found on the omentum and pleura, in the intestine, suprarenal bodies, heart, gall-bladder and trachea.

In animals which live a longer time, but finally succumb, the distribution of the disease is the same but the lesions in the organs and glands are larger, more advanced in caseation and frequently contain calcareous grains. In the lungs, nodules often coalesce, or hepatised patches become tuberculous, and large caseating masses may be found affecting the whole or a part of a lobule. Although the lungs are usually more severely affected than the spleen and liver, occasionally the reverse obtains; the calves in these cases become progressively more and more emaciated and die without any very marked signs of respiratory trouble.

The inoculation of smaller doses of culture, or of tissue emulsion, has frequently given rise to effects as severe as those above described. On several occasions a more chronic but still progressive form of general tuberculosis has been established. In these cases the disease is not so widespread in its distribution and many of the peripheral lymphatic glands, the kidneys, suprarenal bodies, tonsils, intestines, trachea, etc., which are so frequently found to be tuberculous in calves inoculated with 50 mg. of culture, are often normal. The nodules in the affected organs, frequently very large, have dense fibrous capsules and softened caseous contents; on the serous surfaces of the liver and lungs, as also on the parietal pleura and occasionally on the peritoneum, typical "perlsucht" growths may be observed; in none of the experiments, however, with the bovine tubercle bacillus have these developed to the same extent as they often do in natural infections or as they did in the case of a heifer inoculated with a virulent culture of human origin. The glands adjacent to the local lesion, the thoracic, portal and coeliac, show the same relative differences in the degree of caseation as in the 50 mg. inoculations, but fibrotic and calcareous changes are more pronounced.

In many cases, particularly after the inoculation of small doses of tissue emulsions, a very mild form of tuberculosis has been produced and the general health of the animal, save for a transient rise of temperature, has remained unaffected. In these cases neither the local lesion nor the adjacent glands become very large and after a time gradually begin to diminish in size; the local lesion remains uniformly hard or undergoes softening. On post-mortem examination the local lesion is found to be composed of dense caseo-calcareous substance surrounded by fibrous tissue or to be a cyst with caseo-purulent contents and fibrous walls; the adjacent glands and some of the thoracic and abdominal glands contain caseo-calcareous patches and there is a varying number of calcareous tubercles in the organs, the kidneys rarely being affected. In two cases (calves 134 and 202) the disease had not extended beyond the nearest glands.

SUMMARY OF INOCULATION EXPERIMENTS ON THE OX WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

INTRAVENOUS INOCULATIONS.

Adult Bovines Inoculated with Tissue Emulsions.

Virus and Origin of Material.	Number of Animal.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. 1. (Cow 40) -	Heifer 26	290·29	10 cc.	115 days	Killed	The lungs contained a large caseating mass and small scattered nodules; the thoracic glands contained caseous gritty nodules.
B. 1. (Original material through Guinea-Pigs)	Heifer 8	—	10 cc.	25 days	Killed (ill)	Miliary tuberculosis of lungs and thoracic glands; slight tuberculosis of jugular vein and neighbouring prescapular gland.
	Heifer 24	—	10 cc.	18 days	Died	

Inoculated with Culture.

Virus and Origin of Material.	Number of Animal.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. I. (Guinea-pig 14.)	Heifer 10	—	Not estimated.	37 days	Killed	Miliary tuberculosis of lungs and thoracic glands; a few minute foci in the liver, spleen and kidneys; one portal gland was tuberculous.

INTRAPERITONEAL INOCULATIONS.

Inoculated with a Tissue Emulsion.

Virus and Origin of Material.	Number of Animal.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. II. (Heifer 66) -	Calf 136	69·8	205,300 T.B.	188 days	Killed in good health.	Chronic tuberculous peritonitis; tuberculosis of many of the abdominal and thoracic lymphatic glands; no disease in the organs.

INTRAMAMMARY INOCULATIONS.

Cow Inoculated with Culture.

Virus and Origin of Culture.	Number of Cow.	Weight.	Dose inoculated into each of two quarters (L.F. and R.H.)	Duration of Life.	Killed or Died.	Result.
B. I. (Guinea-Pig 14)	40	—	Dose of tubercle bacilli not estimated, but probably small.	92 days	Killed (well)	Extensive tuberculosis of the inoculated quarters and the neighbouring lymphatic glands; numerous tubercles in the lungs; two small nodules in a bronchial gland.

Cows Inoculatied with Tissue Emulsions.

Virus and Origin of Material.	Number of Cow.	Weight in Kilogrammes.	Dose inoculated into each of two quarters (L.F. and R.H.)	Duration of Life.	Killed or Died.	Result.
B. I. (Calf 126) -	44	355·55	1,000,000 T.B.	41 days	Killed (very ill)	Tuberculosis of the inoculated quarters and the nearest glands; no sign of disease elsewhere.
B. I. (Cow 44) -	64	356·45	500,000 T.B.	48 days	Died	Tuberculosis of the inoculated quarters and the nearest glands.
B. I. (Cow 40) -	74	286·16	10 cc. Number of tubercle bacilli not estimated.	297 days	Died	Chronic tuberculosis of udder and nearest glands; extensive tuberculosis of lungs, thoracic and mesenteric glands and tonsils.
B. I. (Organs of 8 Guinea-Pigs)	18	—	—	35 days	Killed	Tuberculosis of inoculated quarters and nearest glands; early tuberculosis of lungs and spleen, and (?) of liver.
B. II. (Original material)	500	—	10 cc. of emulsion; number of tubercle bacilli not known.	32 days	Killed (very ill)	Extensive tuberculosis of the inoculated quarters and nearest glands; no tuberculosis elsewhere.
B. II. (Original material)	4	—		34 days	Killed	Extensive tuberculosis of the inoculated quarters and nearest glands; early tuberculosis of the lungs and bronchial glands.
B. III. (Original material)	68	247·15	14,600,000 T.B.	48 days	Killed	Extensive tuberculosis of inoculated quarters and nearest glands; tuberculosis of lungs, thoracic glands, pleura, peritoneum, intestine and a mesenteric gland.
B. IV. (Calf 138) -	172	358·72	14,670,000 T.B.	399 days	Killed	Chronic tuberculosis of udder and nearest glands; one tubercle in each suprarenal body; no tuberculosis elsewhere.
B. IV. (Calf 138 through Guinea-Pigs 1011 and 1012)	164	305·67	14,670,000 T.B.	47 days	Killed (dying)	Tuberculosis of the inoculated quarters and nearest glands; early general tuberculosis.

SUBCUTANEOUS INOCULATIONS.

Calves Inoculated with Tissue Emulsions.

Virus and Origin of Material.	Number of Calf.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. I. (Monkey 62)	132	31·29	932,800	35 days	Died	General tuberculosis.
	122	31·29	932,800	64 days	Killed (when ill)	General tuberculosis.
B. I. (Heifer 30)	102	113·39	116,660	150 days	Killed (well)	Slight general tuberculosis.
B. I. (Calf 102)	126	45·80	110,000	48 days	Killed (dying)	General tuberculosis.
	128	50·80	110,000	64 days	Killed (dying)	General tuberculosis.
B. I. (Pig 12)	130	41·72	9,000	104 days	Killed (well)	Local lesion caseous and calcareous; neighbouring glands tuberculous; there were a few tubercles in the lungs, liver and spleen; the thoracic and hepatic glands contained gritty foci.
	124	50·80	9,000	71 days	Died	General tuberculosis.
B. I. (Pig 8)	104	50·80	No T.B. found in emulsion	99 days	Killed (well)	Slight general tuberculosis (lesions calcareous).
	106	60·32		100 days	Killed (well)	Local lesion; prescapular gland calcareo-caseous; one tubercle in a mediastinal gland; no disease elsewhere.
B. II. (Calf 134)	160	140·58	542,202,000	160 days	Killed (when ill)	General tuberculosis.
B. II. (Calf 134)	180	114·25	4,480,000	155 days	Killed (well)	General tuberculosis.
B. II. (Heifer 66)	134	71·66	205,306	188 days	Killed (well)	Local lesion only.
B. II. (Calf 134)	178	139·68	200,000	153 days	Killed (well)	General tuberculosis.
B. II. (Calf 134)	158	131·95	5,000	141 days	Killed (well)	Local lesion; tuberculosis of a prescapular and a mediastinal gland.
B. II. (Bull 22)	114	67·10	1,330	161 days	Killed (well)	Slight general tuberculosis.
B. III. (Original Material)	108	63·50	14,600,000	145 days	Killed (well)	Slight general tuberculosis.
	112	71·21	14,600,000	133 days	Killed (well)	Slight general tuberculosis.
B. IV. (Original Material)	118	49·40	11,156,200	100 days	Killed (well)	Slight general tuberculosis; lesions calcareous.
	120	40·36	11,156,200	92 days	Killed (well)	
B. IV. (Calf 120)	138	68·00	1,500,000	202 days	Killed (well)	Local lesion; neighbouring glands tuberculous; nine tubercles in the lungs and scattered tubercles in the thoracic and portal glands.
	140*	69·39	100,000	609 days	Killed (well)	Slight tuberculosis.
B. IV. (Calf 138)	184	96·60	1,500,000	225 days	Killed (well)	Slight general tuberculosis.
B. V. (Original Material)	144	101·60	4,500,000	78 days	Killed (well)	Slight general tuberculosis.

* This Calf was made the subject of an immunity experiment.

CALVES INOCULATED SUBCUTANEOUSLY WITH CULTURE.

50 Milligramme Inoculations.

Virus and Origin of Culture.		Number of Calf.	Weight in Kilo-grammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
B. I.	Cow 40	222	48·50	50 mgs.	18th generation, 21 days old	640 days	35 days	Died	General tuberculosis.
B. I.	Cow 44	228	50·80	50 mgs.	8th generation, 21 days old	371 days	43 days	Killed (ill)	General tuberculosis.
B. I.	Pig 16	230	39·46	50 mgs.	10th generation, 20 days old	360 days	34 days	Died	General tuberculosis.
B. II.	Heifer 66	212	62·13	50 mgs.	9th generation, 20 days old	357 days	25 days	Died	General tuberculosis.
B. II.	Calf 134	226	46·25	50 mgs.	5th generation, 20 days old	227 days	25 days	Killed (ill, not dying)	General tuberculosis.
B. III.	Original material	214	59·41	50 mgs.	8th generation, 18 days old	427 days	45 days	Killed (dying)	General tuberculosis.
B. III.	Calf 214	248	47·60	50 mgs.	8th generation, 20 days old	147 days	46 days	Died	General tuberculosis.
B. IV.	Original material	218	80·73	46 mgs.	16th generation, 20 days old	460 days	32 days	Killed (ill)	General tuberculosis.
		220	94·75	50 mgs			36 days	Died	General tuberculosis.
B. V.	Original material	224	64·85	50 mgs.	5th generation, 20 days old	336 days	42 days	Died	General tuberculosis.
B. V.	Heifer 80	240	44·90	50 mgs.	10th generation, 20 days old	429 days	47 days	Killed (dying)	General tuberculosis.
B. VI.	Original material (through Guinea-pig 1,015)	240	50·80	50 mgs.	6th generation, 20 days old	248 days	54 days	Killed (well)	General tuberculosis, not severe ; the lungs contained fairly numerous small tubercles, the spleen about 30 ; the liver and kidneys appeared normal.
		330	29·48	50 mgs.	14th generation, 20 days old	464 days	32 days	Died	General tuberculosis.
B. VII.	Original material (through Guinea-pig 1,017)	236	45·35	50 mgs.	6th generation, 20 days old	247 days	34 days	Killed (dying)	General tuberculosis.
		238	39·46				22 days	Died	General tuberculosis.
B. VIII.	Original material	254	45·35	50 mgs.	18th generation, 21 days old	321 days	19 days	Died	General tuberculosis.
		256	45·35				37 days	Died	General tuberculosis.
B. IX.	Original material	242	52·16	50 mgs.	11th generation, 20 days old	241 days	43 days	Killed (ill)	General tuberculosis.
B. IX.	Original material (through Guinea-pig 1,069)	244	39·00	50 mgs.	11th generation, 20 days old	241 days	19 days	Killed (dying)	General tuberculosis.
B. X.	Original material (through Guinea-pig 1,070)	260	45·35	50 mgs.	13th generation, 20 days old	295 days	33 days	Died	General tuberculosis.
B. XI.	Original material (through Rabbit 66)	232	81·19	50 mgs.	7th generation, 22 days old	164 days	35 days	Killed (ill)	General tuberculosis.
		234	42·63				38 days	Died	General tuberculosis.

Virus and Origin of Culture.	Number of Calf.	Weight in Kilogrammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
B. XII. Original material	274	32·65	50 mgs.	12th generation, 20 days old	275 days	39 days	Died	General tuberculosis.
	276	29·93				24 days	Died	General tuberculosis.
B. XIII. Original material (through Rabbit 116)	268	38·10	50 mgs.	12th generation, 20 days old	217 days	27 days	Died	General tuberculosis.
	272	39·00				46 days	Killed (ill)	General tuberculosis.
B. XIV. Original material	250	44·44	50 mgs.	11th generation, 19 days old	194 days	30 days	Died	General tuberculosis.
	252	47·60				38 days	Died	General tuberculosis.
B. XV. Original material	270	45·35	50 mgs.	9th generation, 21 days old	169 days	41 days	Died	General tuberculosis.
	278	32·65				47 days	Killed (very ill)	General tuberculosis.
B. XVI. Original material	296	29·02	50 mgs.	8th generation, 21 days old	143 days	32 days	Died	General tuberculosis.
B. XVII. Original material	258	36·74	50 mgs.	6th generation, 20 days old	94 days	18 days	Died	General tuberculosis.
B. XIX. Original material	288	28·57	50 mgs.	5th generation, 21 days old	73 days	14 days	Killed	Early general tuberculosis.
B. XXVI. Original material	418	29·02	50 mgs.	13th generation, 14 days old	308 days	76 days	Died	General tuberculosis.
	422	34·00				44 days	Died	General tuberculosis.

10 MILLIGRAMME INOCULATIONS.

Virus and Origin of Culture.	Number of Calf.	Weight in Kilogrammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
B. V. Heifer 80	352	39·00	10 mgs.	19th generation, 21 days old	642 days	40 days	Died	General tuberculosis.
	354	42·63				90 days	Killed	General tuberculosis.
B. IX. Original material	320	33·10	10 mgs.	20th generation, 20 days old	448 days	37 days	Died	General tuberculosis.
	324	36·28				34 days	Died	General tuberculosis.
B. XVIII. Original material	360	58·51	10 mgs.	16th generation, 20 days old	316 days	91 days	Killed	Slight general tuberculosis.
	362	56·24				53 days	Died	General tuberculosis.
B. XVIII. Original material	364	58·51	10 mgs.	16th generation, 20 days old	316 days	47 days	Died	General tuberculosis.
	366	36·74				33 days	Died	General tuberculosis.
B. XXIII. Original material	344	25·40	10 mgs.	6th generation, 20 days old	110 days	48 days	Died	General tuberculosis.
	346	34·45				38 days	Died	General tuberculosis.
B. XXIV. Original material	340	35·00	10 mgs.	6th generation, 20 days old	110 days	92 days	Killed	General tuberculosis, lesions caseous.
	342	29·93				91 days	Killed	General tuberculosis, lesions calcareous.

25, 12·5 AND 5 MILLIGRAMME INOCULATIONS.

Virus and Origin of Culture.		Number of Calf.	Weight in Kilo-grammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
B. VI.	Original material	216	68·90	25 mgs.	3rd generation, 21 days old	154 days	42 days	Killed (very ill)	General tuberculosis.
B. X.	Original material (through Guinea-pig 1070)	262	66·20	25 mgs.	13th generation, 20 days old	295 days	43 days	Killed (very ill)	General tuberculosis.
B. IV.	Original material	142	122·87	12·5 mgs.	6th generation, 42 days old	292 days	60 days	Killed (dying)	General tuberculosis.
B. XVI.	Original material	292	26·30	5 mgs.	8th generation, 21 days old	143 days	46 days	Killed (ill)	General tuberculosis.

DOSES : 0·02 AND 0·01 MILLIGRAMMES.

Virus and Origin of Culture.		Number of Calf.	Weight in Kilo-grammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
B. III.	Original material	210	49·89	0·02 mg.	8th generation, 18 days old	427 days	143 days	Killed (well)	Slight general tuberculosis.
B. V.	Original material (through Guinea-pig 711)	202	122·87	0·01 mg.	5th generation, 20 days old	336 days	84 days	Killed (well)	Local lesion; tuberculosis of nearest gland; no disease elsewhere.

ADULT BOVINES INOCULATED SUBCUTANEOUSLY.

WITH TISSUE EMULSIONS.

Virus and Origin of Culture.	Number of Animal.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. I. (Cow 40)	Heifer 30	278·46	10 cc.	115 days	Killed	Local lesion; neighbouring glands caseous; caseous nodules in liver, spleen, and lungs; bronchial and mediastinal glands tuberculous.
B. I. (Heifer 30)	Shorthorn Heifer 98.	325·62	116,660 T.B.	137 days	Killed	Local lesion; neighbouring glands tuberculous; no disease elsewhere.
	Heifer 28.	278·91	116,660 T.B.	133 days	Killed	No local lesion; two tubercles in prescapular gland; well marked tuberculosis of lungs and thoracic glands.
B. II. (Original material)	Heifer 16	—	20 cc.	48 days	Killed	General tuberculosis.
B. II. (Original material)	Heifer 14	—	20 cc.	35 days	Killed	General tuberculosis.
B II. (Calf 22)	Shorthorn Heifer 100.	341·94	1,330 T.B.	122 days	Killed	General tuberculosis of a mild type; the tubercles in the organs were small and calcareous.
	Heifer 66	226·75	1,330 T.B.	147 days	Killed	General tuberculosis, not severe.
B. V. (Original material)	Shorthorn Bullock 90.	439·01	4,500,000T.B.	140 days	Killed (well)	Local lesion; caseous nodules in prescapular, bronchial, and mediastinal glands.
	Heifer 80	284·35	4,500,000T.B.	62 days	Killed (well)	Local lesion; nearest glands tuberculous, also thoracic and pancreatic; there were three tubercles in the spleen, five in the liver, and about two dozen in the lungs.

WITH CULTURE.

Virus and Origin of Culture.		Number of Animal.	Weight in Kilogrammes.	Dose.	Generation and Age of Culture.	Total Age of Culture.	Duration of Life.	Killed or Died.	Result.
. V.	Original material	Bull 88	476·25	50 mgs.	5th generation, 20 days old	336 days	45 days	Killed (well)	General tuberculosis, not very severe.
. VI.	Original material (through Guinea-pig 1015)	Cow 300	273·45	100 mgs.	14th generation, 20 days old	446 days	30 days	Died	General tuberculosis.

INOCULATION EXPERIMENTS WITH GOATS AND PIGS.

GOATS.

Inoculation experiments with goats have not been numerous, but they are sufficient to show that general progressive tuberculosis is readily set up in these animals when the material is inoculated subcutaneously. Three goats were inoculated subcutaneously with tissue emulsions, containing estimated doses of tubercle bacilli. One inoculated with an emulsion of the original material of Virus B. V. containing 4·5 million tubercle bacilli died in fifty-four days of general tuberculosis, the lungs being very severely affected and riddled with small cavities.

The other two goats were inoculated with an emulsion made from the organs of guinea-pigs (Calf 134. Virus B. II.), one receiving 4,450,000 tubercle bacilli, the other approximately 5,000 tubercle bacilli. The former was killed when apparently well, 165 days after inoculation, and showed slowly progressing general tuberculosis; the latter, killed 161 days after inoculation, also showed general tuberculosis, but of a much less severe type than in the former; in both cases the intestines and mesenteric glands were tuberculous.

One goat was inoculated with 0·01 mg. of culture derived from Virus B. V. through Guinea-pig 711; this goat was killed in apparent good health 91 days after inoculation; on post-mortem examination the animal was found to have slowly progressing general tuberculosis.

The lesions in the goat exhibit a marked tendency to break down and soften, and in the lungs cavities filled with caseo-pus are formed which often ulcerate into bronchi; in one goat, No. 10, caseo-pus was found in the larynx after death.

The extensive tuberculosis of the intestines and mesenteric glands found in Goats 6 and 10 was no doubt due to ingestion of caseo-pus coughed up from the lungs.

At the same time as each of the four goats a calf was inoculated subcutaneously with an equivalent dose of culture or emulsion; the experiments therefore enable a comparison to be made of the relative susceptibility of goats and calves to tuberculosis.

The comparison shows clearly that the goat is more susceptible to the bovine tubercle bacillus than the calf; as will be seen from the table, in each set of experiments the goat was more severely affected than the calf.

	Goats.			Calves.		
	Number.	Duration of Life.	Result.	Number.	Duration of Life.	Result.
Dose: 5,000 T.B.	6	Killed 161 days.	General tuberculosis of moderate severity.	158	Killed 141 days.	Local lesion; tuberculous prescapular gland; one tubercle in a mediastinal gland.
Dose: 4,480,000 T.B.	10	Killed 165 days.	General tuberculosis, much more severe than in Goat 6.	180	Killed 155 days.	General tuberculosis; large chronic nodules in all the organs.
Dose: 4,500,000 T.B.	2	Died 54 days.	General tuberculosis; lungs severely affected.	144	Killed 78 days.	General tuberculosis; not severe.
Dose: 0·01 mg. of Culture.	28	Killed 91 days.	Moderately severe general tuberculosis.	202	Killed 84 days.	Local lesion; tuberculous prescapular gland; no disease elsewhere.

PIGS.

Inoculated with Tissue Emulsion.

Four pigs have been inoculated subcutaneously with emulsions of tuberculous tissues, two with an emulsion, in which no tubercle bacilli were found, made from the mesenteric glands of Pig 8 (fed with milk of Cow 40, Virus B. I.), and two with an emulsion made from the tuberculous organs of one of the latter animals, the dose in each case containing approximately 9,000 tubercle bacilli. The pigs gained considerably in weight, and were in apparent good health when killed in periods varying from 105 to 126 days after their inoculation.

On post-mortem examination all the pigs showed chronic general tuberculosis, the lesions in the organs having a retrogressive character.

Inoculated with Pure Culture.

Seven pigs have been inoculated subcutaneously with doses of culture varying from 0·1 mg. to 10 mg.

One pig inoculated with 1 mg. of culture derived from the original material of Virus B. IV. and killed 61 days after, showed general miliary tuberculosis, the lungs being very severely affected.

This animal was inoculated at the same time, and with an equivalent dose of culture as Chimpanzee 4. The chimpanzee died 56 days after inoculation, whereas the pig was in apparent good health when killed.

The post-mortem results showed the pig to be quite as severely affected as the chimpanzee in the number and extent of distribution of the tubercles; the absence, however, of any marked disturbance of health appears to indicate that the pig is more capable of neutralising the toxines elaborated by the bacillus than is the chimpanzee.

Another pig inoculated with 1 mg. of culture derived from the original material of Virus B. IX. was killed when very ill 92 days after inoculation; the post-mortem examination showed general progressive tuberculosis; the lungs were extensively consolidated and in a condition of caseous pneumonia.

Two pigs were inoculated with culture obtained from Pig 16, one receiving 1·0 mg., the other 0·1 mg.

The former died from pneumonia in 78 days, and showed general tuberculosis, not very severe.

The other pig inoculated with 0·1 mg. remained well, and when killed, 240 days after inoculation, showed a very mild form of general tuberculosis, the lesions in the organs having a retrogressive character.

Three pigs were inoculated with culture from the original material of Virus B. XXVIII., the doses being 10·1 and 0·1 mg. respectively.

The pig inoculated with 1·0 mg. died in 48 days of general tuberculosis. The others remained well and were killed in 81 and 83 days respectively; in both animals there was generalised tuberculosis, not extremely severe, and not apparently progressing.

General Results.—The experiments show that general tuberculosis is very readily set up in pigs by subcutaneous inoculation; the disease produced, however, is not necessarily fatal and, when the dose is small, or in the adult, may run a very chronic course, and become apparently arrested.

In several of the pigs which were killed in good health, the uniformity in size of the lesions was very noteworthy.

It has been shown that tubercle bacilli are very quickly disseminated over the body of a pig after subcutaneous inoculation, and it would appear that the severity of the resulting disease depended, to a large degree, on the extent of this initial dissemination.

SUMMARY OF INOCULATION EXPERIMENTS ON GOATS AND PIGS WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

GOATS.

Inoculated Subcutaneously with Culture.

Virus.	Source of Culture.	Number of Goat.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. V.	G. Pig 711	28	26·30	0·01 mg.	91 days	Killed	General tuberculosis.

GOATS.

Inoculated Subcutaneously with Tissue Emulsions.

Virus.	Material Inoculated.	Number of Goat.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. V.	Original material	2	24·47	4,500,000 T.B.	54 days	Died	General tuberculosis.
B. II.	Calf 134	10	25·40	4,480,000 T.B.	165 days	Killed	General progressive tuberculosis.
		6	28·57	5,000 T.B.	161 days	Killed	General tuberculosis, not severe.

PIGS.

Inoculated Subcutaneously with Culture.

Virus.	Source of Culture.	Number of Pig.	Age.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. IV.	Original material	94	10½ weeks	12·09	1·0 mg.	61 days	Killed	General tuberculosis ; lungs severely affected.
B. I.	Pig 16	98	21 weeks	19·95	1·0 mg.	78 days	Died	General tuberculosis, not severe; lungs showed patches of pneumonic consolidation.
B. I.	Pig 16	96	21 weeks	23·12	0·1 mg.	240 days	Killed (well)	Slight general tuberculosis (retrogressive).
B IX.	G.P. 1069	138	13 weeks	17·68	1·0 mg.	92 days	Killed (ill)	General tuberculosis ; lungs severely affected.
B. XXVIII.	Original material	156	9 weeks	16·31	10·0 mg.	81 days	Killed (well)	General tuberculosis (slowly progressing).
B. XXVIII.	Original material	158	9 weeks	15·86	1·0 mg.	48 days	Died	General miliary tuberculosis.
B. XXVIII.	Original material	160	9 weeks	14·06	0·1 mg.	83 days	Killed (well)	General tuberculosis.

PIGS.

Inoculated Subcutaneously with Tissue Emulsions.

Virus.	Material Inoculated.	Number of Pig.	Weight in Kilogrammes.	Dose.	Duration of Life.	Killed or Died.	Result.
B. I.	Mesenteric Gland, Pig 8	10	19·95	No T.B. found in the emulsion	126 days	Killed in good health	General tuberculosis.
B. I.	Mesenteric Gland, Pig 8	12	17·23		120 days	Killed in good health	General tuberculosis.
B. I.	E. of Spleen, Inguinal, and Hepatic Glands of Pig 12.	14	17·23	9,000 T.B.	115 days	Killed (well)	General tuberculosis, not severe.
B. I.		16	19·05	9,000 T.B.	105 days	Killed (well)	General tuberculosis.

INOCULATION EXPERIMENTS ON CHIMPANZEES, MONKEYS (*MACACUS RHESUS*), BABOONS (*PAPIO PORCARIUS*), AND LEMURS.

CHIMPANZEES.

Two young chimpanzees have been inoculated subcutaneously with culture.

One, inoculated with 1·0 mg. of culture from the original material of Virus B. IV., died in 56 days of acute miliary tuberculosis.

The other, inoculated with 0·001 mg. of culture, obtained from Chimpanzee 16 (third of a series of chimpanzees), the first of which was fed with milk of Cow 172, Virus B. IV., died in 87 days of general tuberculosis.

The animals were inoculated under the skin of the back, and in the latter case infection spread through the intercostal spaces to the vertebral glands, and caused an extensive tuberculous pleurisy on the right side.

BABOONS.

Two young baboons were inoculated with culture derived from the original material of Virus B. IV., each receiving 1·0 mg.

One died a short time after inoculation, and showed a local lesion only. The other died in 49 days of general tuberculosis.

RHESUS MONKEYS.

Inoculated with Tissue Emulsions.

Three monkeys, inoculated intravenously with emulsions of tuberculous tissues (dose not estimated) died in 9, 15 and 19 days respectively of acute tuberculosis; in the animal which died in 9 days there were no definite tuberculous lesions, but tubercle bacilli were numerous in all the organs.

Two monkeys inoculated subcutaneously with emulsions made from animals inoculated with Virus B. I. died in 41 and 43 days respectively of acute general tuberculosis.

Another rhesus inoculated subcutaneously with a small dose of an emulsion made from the spleen of Monkey 132 (Passage experiment Virus B. IX.) died in 111 days of general tuberculosis, the intestines and mesenteric glands being extensively tuberculous (due, no doubt, to the animal swallowing the discharges from the local lesion and ulcerated axillary glands).

Inoculated with Culture.

Seven monkeys have been inoculated with culture. Six received doses ranging from 0·001 mg. to 10 mg.; all these developed severe general tuberculosis and succumbed to the disease in periods varying from 33 to 56 days.

The other rhesus monkey was inoculated with a small quantity of culture derived from Virus B. I., through Guinea-pig 14, dose not estimated. This animal died in 74 days of general tuberculosis.

LEMURS.

Two lemurs were inoculated subcutaneously with culture obtained from Lemur 2 (fed with culture, Virus B. IX.); one, inoculated with 1·0 mg., was killed, when dying, 23 days after inoculation; the other, inoculated with 0·01 mg., died in 30 days.

The first lemur showed a local lesion, caseation of the nearest glands and early tuberculosis of the spleen. In the other lemur the disease was rather more advanced, a few tubercles being visible in the lungs, spleen and liver.

General Results.

The experiments show that the chimpanzee and the various species of monkeys used are highly susceptible to the bovine tubercle bacillus. This high susceptibility is so clearly established that it seems to me unnecessary to perform any more experiments on the same lines.

SUMMARY OF INOCULATION EXPERIMENTS ON CHIMPANZEES, BABOONS, RHESUS MONKEYS, AND LEMURS, WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

CHIMPANZEES.

Inoculated Subcutaneously with Culture.

Virus.	Source of Culture.	Number of Chimpanzee.	Dose.	Duration of Life.	Killed or Died.	Result.
B. IV.	Original material	4	1·0 mg.	56 days	Died	General tuberculosis.
B. IV.	Chimpanzee 16	22	0·001 mg.	87 days	Died	General tuberculosis; extensive tuberculous pleurisy on the right side.

BABOONS.

Inoculated Subcutaneously with Culture.

Virus.	Source of Culture.	Number of Baboon.	Dose.	Duration of Life.	Killed or Died.	Result.
B. IV.	Original material	36	1·0 mg.	3 days	Died	No sign of tuberculosis beyond the site of inoculation.
B. IV.	Original material	46	1·0 mg.	49 days	Died	General tuberculosis.

RHESUS MONKEYS.

Inoculated Subcutaneously with Culture.

Virus.	Source of Culture.	Number of Monkey.	Dose.	Duration of Life.	Killed or Died.	Result.
B. I.	G.P. 14	10	Small quantity	74 days	Died	General tuberculosis.
B. IX.	Monkey 110	114	1 mg.	33 days	Died	General tuberculosis.
B. IX.	Monkey 110	116	0·01 mg.	36 days	Died	General tuberculosis.
B. XXVI.	Original material	142	10·0 mg.	35 days	Died	General tuberculosis.
B. XXVI.	Original material	146	1·0 mg.	45 days	Died	General tuberculosis.
B. XXVI.	Original material	144	0·1 mg.	56 days	Killed (dying)	General tuberculosis.
B. XXVI.	Original material	142	0·001 mg.	45 days	Died	General tuberculosis.

RHESUS MONKEYS.

Inoculated with Tissue Emulsions.

Virus.	Material Inoculated.	Number of Monkey.	Dose.	Method of Inoculation.	Duration of Life.	Killed or Died.	Result.
B. I.	E. of organs of G.P. 130. (Virus B. I.)	4	0·5 cc.	Intravenous	15 days	Died	Acute tuberculosis.
B. I.	E. of spleen of Monkey 2	20	—	Intravenous	9 days	Died	No tuberculous lesions, but T.B. found in all the organs.
B. I.	E. of spleen of Monkey 20	18	1·5 cc.	Intravenous	17 days	Died	Miliary tuberculosis.
B. I.	E. of organs of G.P. 130. (Virus B. I.)	2	1·0 cc.	Subcutaneous	41 days	Died	General tuberculosis.
B. I.	E. of spleen of Monkey 18	22	2·0 cc.	Subcutaneous	43 days	Died	General tuberculosis.
B. IX.	E. of spleen of Monkey 132.	152	Very small.	Subcutaneous	111 days	Died	General tuberculosis; intestines and mesenteric glands severely affected.

LEMURS.

INOCULATED SUBCUTANEOUSLY WITH CULTURE.

Virus.	Source of Culture.	Number of Lemur.	Dose.	Duration of Life.	Killed or Died.	Result.
B. IX.	Lemur 2	12	1·0 mg.	23 days	Killed	Local lesion ; caseation of nearest glands and early tuberculosis of spleen.
B. IX.	Lemur 2	10	0·1 mg.	30 days	Died	Early general tuberculosis.

VIRUS B I.

May 6, 1902.

LUNG AND THORACIC GLAND.

The material was taken from a cow with extensive tuberculosis of the lungs and thoracic glands.

TABLE 1A

VIRUS B I.
(May 6, 1902.)
LUNG.

GUINEA-PIG 14.
Killed, August 4, 1902.

CULTURE.

GUINEA-PIGS.
August 30, 1902.

146	Died	43 days	G.T.	S.
147	,,	17 ,,	G.T.	I.

Inoculated, September 30, 1902. Doses not estimated.

HEIFER 12.

Subcutaneous.
Killed, January 3, 1903
(95 days).

P.M.—Suppurating local lesion; precrural gland enlarged, caseous and gritty; thoracic lymphatic glands and spleen slightly affected.

GUINEA-PIGS.

Spleen.	287	Died	146 days	G.T.	I.
Bronch. gland.	288	,,	66 ,,	G.T.	I.
Medias. gland.	290	,,	76 ,,	G.T.	I.
Kidney.	289	Killed	62 ,,	H.	I.

MONKEY 10.
Subcutaneous.
Died, December 13, 1902
(74 days).

P.M.—Local ulcer; neighbouring glands caseous; tuberculosis of lungs, liver, and spleen; kidneys and diaphragm slightly affected.

GUINEA-PIGS.

Guinea-Pigs inoculated from the lung, spleen, liver, and mastoid gland all developed tuberculosis.

COW 40. Int. Mamm.

Killed, December 31, 1902
(92 days).
P.M.: $\mathbf{E}^1$.

Tuberculosis of the inoculated quarters, supramammary and iliac lymphatic glands; numerous tubercles in the lungs; two nodules in one bronchial gland.

GUINEA-PIGS.

184	Died	145 days	G.T.	S.
185	,,	48 ,,	G.T.	I.

HEIFER 10.

Intravenous.
Killed, November 6, 1902
(37 days).

P.M.—Miliary tuberculosis of the lungs and thoracic glands; a few minute foci in the liver, spleen and kidneys.

GUINEA-PIGS.

Liver.	222	Died	84 days	G.T.	I
Spleen.	223	,,	24 ,,	G.T.	I
Kidney.	224	,,	24 ,,	G.T.	I
Lung.	225	,,	30 ,,	G.T.	I

Inoculated with emulsion of mammary gland of Cow 40.

CALF 38.

Feeding Experiment.
Suckled by its mother, Cow 40, from October 18, 1902, to December 31, 1902.
(74 days).
Killed, December 30, 1902
(74 days).

P.M.—Slight tuberculosis limited to intestines and mesenteric glands.

GUINEA-PIGS.

Mesenteric Glands	283	Died	12 days	No T.	S.
	284	,,	62 ,,	G.T.	I.
	285	,,	104 ,,	G.T.	S.

GUINEA-PIGS.

Dose	272	Died	107 days	G.T.	S.
1·0 cc.	273	,,	45 ,,	G.T.	I.

HEIFER 30.

Subcutaneous.
Dose: 10 cc.
Killed, April 25, 1903
(115 days).

P.M.—Suppurating local lesion; enlarged caseous precrural gland; a few nodules in lungs and thoracic glands; small nodules in liver and spleen.

HEIFER 26.

Intravenous.
Dose: 10 cc.
Killed, April 25, 1903
(115 days).

P.M.—Scattered tubercles and one large nodule in the lungs; mediastinal and bronchial glands tuberculous.

GUINEA-PIGS
from left bronchial gland.

378	Died	73 days	G.T.	S.
379	,,	55 ,,	G.T.	S.
380	,,	79 ,,	G.T.	I.

COW 74.

Intramammary.
Dose: 10 cc. into each quarter
Died, October 26, 1903
(299 days).

P.M.—Chronic tuberculosis of the inoculated quarters and supramammary lymphatic glands; extensive tuberculosis of lungs, thoracic glands, tonsils, pharyngeal and mesenteric glands; ulcers in small and large intestines.

GUINEA-PIGS.

Mediastinal gland.	656	Died	37 days	G.T.	S.
	657	,,	46 ,,	G.T.	S.
Supramammary gland.	658	,,	11 ,,	T.	I.
	659	,,	13 ,,	T.	I.

For animals fed with milk, see Table 1 B.

Precrural gland.

HEIFER 28.

Subcutaneous.
Dose: 116,600 T.B.
Killed, September 5, 1903
(133 days).

P.M.—No local lesion; two tubercles in the prescapular gland; tuberculosis of lungs and thoracic glands.

GUINEA-PIGS.

Prescapular gland.	540	Died	43 days	G.T.	I.
	541	,,	86 ,,	G.T.	I.
Bronchial glands.	542	,,	38 ,,	G.T.	S.
	543	,,	41 ,,	G.T.	S.
Spleen.	544	Killed	87 ,,	No T.	S.

CALF 102.

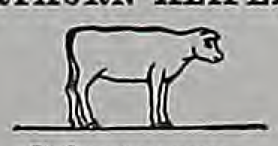
Subcutaneous.
Dose: 116,600 T.B.
Killed, September 22, 1903
(150 days).

P.M.—Calcareous local lesion and prescapular gland; slight tuberculosis of liver, spleen, lungs, and thoracic glands.

GUINEA-PIGS.

Precrural gland. Dose: 11,666 T.B.	374	Died	56 days	G.T.	S.
	375	,,	91 ,,	G.T.	I.
	376	,,	71 ,,	G.T.	S.& I.
	377	,,	50 ,,	G.T.	I.

SHORTHORN HEIFER 98.



Subcutaneous.
Dose: 116,600 T.B.
Killed, September 9, 1903
(137 days).

P.M.—Suppurating local lesion; abscess cavities in prescapular gland; a few caseous tubercles in a prepectoral gland.

GUINEA-PIGS
from prescapular gland.

550	Died	46 days	G.T.	S.
551	,,	48 ,,	G.T.	S.
552	,,	41 ,,	G.T.	I.
553	,,	30 ,,	G.T.	I.

Prescapular gland.

GUINEA-PIGS.

Prescapular gland. Dose: 5,500 T.B.	582	Died	65 days	G.T.	S.
	583	,,	35 ,,	G.T.	S.
	584	,,	32 ,,	G.T.	I.
	585	,,	31 ,,	G.T.	I.
Liver.	586	Killed	58 ,,	No T.	S.

CALF 126.

Subcutaneous.
Dose: 110,000 T.B.
Killed, November 4, 1903
(45 days).

P.M.—Large caseous lesion; adjoining glands caseous; general tuberculosis.

CALF 128.

Subcutaneous.
Dose: 110,000 T.B.
Killed, November 25, 1903
(64 days).

P.M.—Huge local lesion; adjacent glands caseous throughout; general tuberculosis.

G.P.'s from prescapular gland.

723	Died	34 days	G.T.	S.
724	,,	53 ,,	G.T.	S.
725	,,	17 ,,	G.T.	I.
726	,,	19 ,,	G.T.	I.

Inoculated with emulsion of prescapular gland of Calf 126.

RABBITS.
Dose in each case:
1,000,000 T.B.

7	Died	116 days	G.T.	S.

GUINEA-PIGS.
Dose in each case: 5,000 T.B.

671	Died	63 days	G.T.	I.
672	,,	117 ,,	G.T.	S.

COW 44.

Intramammary.

HEIFER 28.

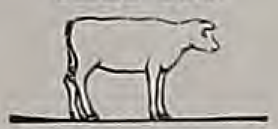
Subcutaneous.
Dose: 116,600 T.B.
Killed, September 5, 1903
(133 days).

P.M.—No local lesion; two tubercles in the prescapular gland; tuberculosis of lungs and thoracic glands.

GUINEA-PIGS.

Prescapular gland.	540	Died	43 days	G.T.	I.
	541	,,	86 ,,	G.T.	I.
Bronchial glands.	542	,,	38 ,,	G.T.	S.
	543	,,	41 ,,	G.T.	S.
Spleen.	544	Killed	87 ,,	No T.	S.

CALF 102.



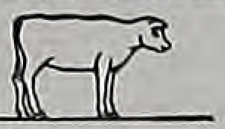
Subcutaneous.
Dose: 116,600 T.B.
Killed, September 22, 1903
(150 days).

P.M.—Calcareous local lesion and prescapular gland; slight tuberculosis of liver, spleen, lungs, and thoracic glands.

GUINEA-PIGS.

Precrural gland. Dose: 11,666 T.B.	374	Died	56 days	G.T.	S.
	375	,,	91 ,,	G.T.	I.
	376	,,	71 ,,	G.T.	S.& I.
	377	,,	50 ,,	G.T.	I.

SHORTHORN HEIFER 98.



Subcutaneous.
Dose: 116,600 T.B.
Killed, September 9, 1903
(137 days).

P.M.—Suppurating local lesion; abscess cavities in prescapular gland; a few caseous tubercles in a prepectoral gland.

GUINEA-PIGS
from prescapular gland.

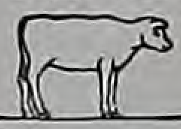
550	Died	46 days	G.T.	S.
551	,,	48 ,,	G.T.	S.
552	,,	41 ,,	G.T.	I.
553	,,	30 ,,	G.T.	I.

Prescapular gland.

GUINEA-PIGS.

Prescapular gland. Dose: 5,500 T.B.	582	Died	65 days	G.T.	S.
	583	,,	35 ,,	G.T.	S.
	584	,,	32 ,,	G.T.	I.
	585	,,	31 ,,	G.T.	I.
Liver.	586	Killed	58 ,,	No T.	S.

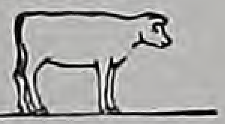
CALF 126.



Subcutaneous.
Dose: 110,000 T.B.
Killed, November 4, 1903
(45 days).

P.M.—Large caseous lesion; adjoining glands caseous; general tuberculosis.

CALF 128.



Subcutaneous.
Dose: 110,000 T.B.
Killed, November 25, 1903
(64 days).

P.M.—Huge local lesion; adjacent glands caseous throughout; general tuberculosis.

G.P.'s from prescapular gland.

723	Died	34 days	G.T.	S.
724	,,	53 ,,	G.T.	S.
725	,,	17 ,,	G.T.	I.
726	,,	19 ,,	G.T.	I.

Inoculated with emulsion of prescapular gland of Calf 126.

RABBITS.
Dose in each case:
1,000,000 T.B.

7	Died	116 days	G.T.	S.
8	,,	82 ,,	G.T.	I.

GUINEA-PIGS.
Dose in each case: 5,000 T.B.

671	Died	63 days	G.T.	I.
672	,,	117 ,,	G.T.	S.
673	Killed	49 ,,	G.T.	I.
674	Died	48 ,,	G.T.	I.

COW 44.

Intramammary.
Dose: 1,000,000 T.B. into each quarter.
Killed, December 15, 1903
(41 days).

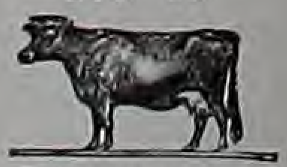
P.M.—Tuberculosis of inoculated quarters, supramammary and left iliac lymphatic glands.

GUINEA-PIGS.

Spleen.	758	Died	25 days	T.	S.

For guinea-pigs inoculated with milk, see page 82.

COW 64.



Intramammary.
Dose: 500,000 T.B. into each quarter.
Died, January 22, 1004
(48 days.)

P.M.—Tuberculosis of inoculated quarters, supramammary and left iliac lymphatic glands; left precrural and right popliteal tuberculous; minute foci in liver, lungs, and thoracic lymphatic glands.

GUINEA-PIGS.

Supra-mammary gland.	820	Died	28 days	G.T.	S.
	821	,,	17 ,,	T.	I.
Spleen.	824	,,	55 ,,	G.T.	S.
Fœtal spleen	825	,,	102 ,,	G.T.	S.

For Guinea-pigs inoculated with milk see page 86.

ORANG 4.
Fed with milk for 12 days.
Died, December 9, 1903
(16 days after the experiment began).
P.M.—No microscopical evidence of tuberculosis.

GUINEA-PIGS.

Mesenteric glands.	744	Killed	77 days	H.	S.
	745	,,	75 ,,	H.	I.
Liver.	746	,,	77 ,,	H.	I.
Lung.	747	Died	1 day	—	I.
Spleen.	748	Killed	51 days	H.	I.

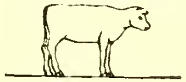
VIRUS B.I.
(May 6th, 1902.

LUNG AND MEDIASTINAL GLAND.

8 GUINEA-PIGS.

Emulsion of tuberculous organs of Guinea-pigs, inoculated May 24th, 1902.

HEIFER 8.



Intravenous.

Killed, ill, June 18th, 1902 (25 days).

P.M.—Miliary tuberculosis of lungs and thoracic glands.

GUINEA-PIG 59.

Inoculated subcutaneously.

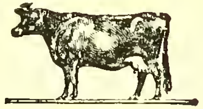
Died of general tuberculosis in 58 days.

GUINEA-PIG 130.

Inoculated subcutaneously.
Died of general tuberculosis in 52 days.

(The virus from this guinea-pig was used for the Monkey Passage Experiment. *See* Table 1 D.)

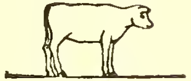
COW 18.



Intramammary.
Killed, June 28th, 1902 (35 days).

P.M.—Tuberculosis of inoculated quarters, supramammary, iliac and lumbar lymphatic glands; early tuberculosis of spleen, lungs and thoracic glands.
No Guinea-pigs inoculated except with milk.

CALF 20.



Sucking.
Fed for 34 days.

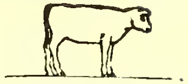
Killed, January 8th, 1903. 229 days after the experiment began

P.M.—Tuberculosis of the small intestine and mesenteric glands; slight tuberculosis of the pleura.

GUINEA-PIGS.

Lung	297	Died	27 days	T.	I.
Bronchial gland	298	Killed	47 days	G.T.	I.
Spleen	299	Died	34 days	No T.	I.
Mesenteric gland	300	Died	47 days	G.T.	I.

HEIFER 24.



Intravenous.
Died, June 11th, 1902 (18 days).

P.M.—Miliary tuberculosis of lungs and bronchial glands.

TABLE I. c.

VIRUS B. I.

MONKEY 72.

Fed on October 26th, 1903, with a small quantity of milk from Cow 74.

Died, November 15, 1903 (20 days).

P.M.—Organs and glands normal to the naked eye.

GUINEA-PIGS.

Submaxillary Gland.	704	Killed	32 days	S.T.	I.
Mesenteric Gland.	705	Died	22 „	T.	I.

MONKEY 62.

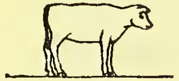
Fed for 66 days with tuberculous milk from Cow 74.

Killed, September 8, 1903 (72 days).

P.M. — Alimentary tract, neck glands and mesenteric glands unaffected; minute foci in two colic glands; tubercles in liver, spleen and kidneys; extensive tuberculosis of lungs and thoracic glands.

Spleen, right lung and mediastinal glands.

CALF 122.



Subcutaneous.
Dose: 932,800 T.B.
Killed, November 11, 1903 (64 days).
P.M.—Large cystic local lesion; neighbouring glands caseous throughout; general tuberculosis.

G.P.'s from prescapular gland.

691	Died	71 days	G.T.	S.
692	„	47 „	G.T.	S.
693	„	25 „	T.	I.
694	„	29 „	G.T.	I.

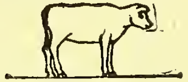
Rabbits from prescapular gland.

9	Died	45 days	G.T.	I.V.
10	„	96 „	G.T.	S.

GUINEA-PIGS.

Emulsion.	545	Died	45 days	G.T.	S.
	546	„	36 „	G.T.	S.
	547	„	18 „	G.T.	I.
	548	„	21 „	G.T.	I.
Liver.	549	„	94 „	G.T.	S.

CALF 132.



Subcutaneous.
Dose: 932,800 T.B.
Died, October 13, 1903 (35 days).
P.M.—Acute miliary tuberculosis.

G.P.'s from prescapular gland.

638	Died	35 days	G.T.	S.
639	„	31 „	G.T.	S.
640	„	12 „	T.	I.
641	„	12 „	T.	I.

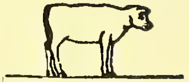
MONKEY 70.

Fed for 5 days with milk of Cow 74; experiment began October 21, 1903.

Killed, when ill, November 14, 1903, 24 days after the experiment began.

P.M.—Tuberculosis of mesenteric and colic glands; acute miliary tuberculosis of the lungs; enlargement and early caseation of the thoracic glands.

CALF 86.



Suckled by Cow 74 from January 7, 1903, to July 16, 1903 (190 days).

Killed, July 16, 1903, 190 days after the experiment began.

P.M.—Slight tuberculosis of intestines and mesenteric glands; two tubercles in the liver

GUINEA-PIGS.

Mesenteric Glands.	479	Died	59 days	G.T.	S.
	480	„	47 „	G.T.	S.
	481	„	38 „	G.T.	I.
	482	„	37 „	G.T.	I.
Spleen.	483	„	85 „	No T.	I.
Muscle.	484	„	45 „	No T.	I.

NOTE.—The full post-mortem notes of the Monkeys and Calf 86 are given in the Report on "Feeding Experiments with the Bovine Tubercle Bacillus." (*See* pages 651 to 654 and 677).

HEIFER 12.

Subcutaneous.—Inoculation of 5 cc. of an emulsion of culture from the original material of Virus B.I. through Guinea-Pig 14.

Dose—Not estimated.

Date—September 30th, 1902.

Age—1 year 9 months.

Killed—January 3rd, 1903. 95 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously in the left flank on September 30th, 1902.

A hard swelling appeared at the seat of inoculation, which on October 24th, 24 days after inoculation, had reached the size of a goose's egg: after this it ceased to increase. The animal remained well and became very fat. The temperature continued normal throughout.

POST-MORTEM EXAMINATION.

The body was unusually fat.

The Local Lesion.—Was formed of two parts.

(*a*) Purely subcutaneous, was a three-cornered mass of about $1\frac{1}{4}$ in. each way, formed of entirely softened caseous matter, contained in an irregular branching cavity, the walls of which were of dense fibrous tissue.

(*b*) Another mass, measuring 3 in. by $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in., embedded in muscle, and consisting of a ramifying abscess containing turbid fluid and curdy masses of yellow caseous matter, with a dense fibrous wall closely incorporated with the muscular tissue.

The Left Precrural Gland.—Weighed 4 ozs., and measured 4 in. by 2 in. by $1\frac{1}{2}$ in. It contained throughout numerous little yellow tubercles, which at two points at least had run more or less together, forming an irregular mass of about $\frac{3}{4}$ in. diameter. These larger caseous masses were partly calcified.

Spleen.—Contained two or more little hard white shot-sized bodies. Normal structures (?).

Kidneys.—Normal, except for a pale wedge-shaped area in the cortex of one of them. Not apparently altered in structure.

Liver, Pancreas, Suprarenals, Uterus, Ovaries, Pharynx, Tonsils, Thymus, Heart, Pericardium, Pleuræ, Peritoneum, Intestines (inspected only from without).—Apparently perfectly normal.

Lungs.—Perfectly healthy at first sight. Showed on close inspection numerous little dark specks on the surface of some parts.

Bronchial Gland, Mediastinal Glands.—Were not apparently enlarged, but on section were drier than usual, and presented a mottled appearance, which was difficult to describe, but which was suspicious.

Some other glands, namely, the hepatic lymphatic glands and one gland near the end of the ileum, showed small specks of congestion, (or hæmorrhages) but were not otherwise abnormal.

The rest of the mesenteric and mesocolic glands were perfectly healthy.

The Right Precrural Gland, Iliac and Lumbar Lymphatic Glands.—Unaltered.

Microscopic Examination (Smear Preparations).

Caseous Matter from Local Tumour.—No tubercle bacilli seen.

Fluid from Local Tumour.—No tubercle bacilli seen.

Scraping from L. Precrural Gland.—No tubercle bacilli seen.

Little White Body from Spleen.—No tubercle bacilli seen.

Emulsion of Spleen containing one of the above. (Used for guinea-pig which died tuberculous).—No tubercle bacilli seen.

Emulsion of Kidney, containing the pale wedge-shaped area. (Used for guinea-pig.)—No tubercle bacilli seen.

Emulsion of Bronchial Gland. (Used for guinea-pig which died tuberculous). No tubercle bacilli seen.

Emulsion of Post-Mediastinal Gland. (Used for guinea-pig which died tuberculous). No tubercle bacilli seen.

Lung. No tubercle bacilli seen.

Guinea-pigs inoculated.

Three guinea-pigs inoculated intraperitoneally from the spleen, bronchial gland and mediastinal gland respectively died of general tuberculosis in 66, 76, and 146 days respectively.

A guinea-pig inoculated from the kidney remained healthy.

HEIFER 10.

Intravenous—Inoculation of 5 cc. of an emulsion of culture from the original material of Virus B. I., through Guinea-Pig 14.

Dose—Not estimated.

Date—September 30th, 1902.

Age—1 year 9 months.

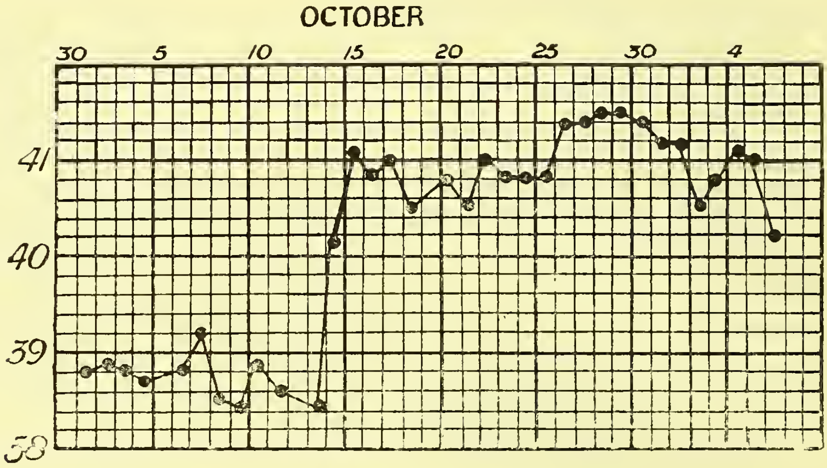
Killed—When very ill, November 6th, 1902. 37 days after inoculation.

Clinical History.

The heifer was inoculated intravenously on September 30th, 1902.

The animal remained well until the 14th day when the temperature began to rise quickly, reaching 41·1°C. (106° F.) on the 15th. On the 16th day there was some shivering, the coat was roughened and the respirations were increased in frequency. Later on there was some cough and the appetite began to fail. Respirations gradually became more frequent (up to 74 per minute) and more laboured, and there was marked loss in flesh. The general condition at the time of death was similar to that of Heifer 8, killed on the 25th day after an intravenous injection.

Temperature.



POST-MORTEM EXAMINATION.

Thorax.

The Lungs, freed from all glands, etc., weighed 17½ lbs. They were full of little separate tubercles of sizes varying up to a good sized shot, packed almost as closely as they could possibly be. They stood out from the surface as hemispherical elevations. They were most numerous in the cephalic and ventral portions and least numerous in the dorsal regions. In the latter there was also marked interstitial emphysema.

The Thoracic Glands were greatly enlarged and full of tubercles especially in the cortex.

The Dorsal Mediastinal Glands weighed 9½ ozs.

The Ventral Mediastinal Glands weighed 2½ ozs.

The Bronchial Glands weighed 11½ ozs.

The Heart was normal.

There was no excess of pericardial fluid, but probably a slight excess of pleural fluid.

The Costal Pleura near the diaphragm and the pleural surface of the diaphragm was covered with vascular vegetations. (No tubercle bacilli were found in these.) Similar patches of vascular vegetations appeared in the posterior part of the pericardium in contact with the dorsal surface of the auricles. (No tubercle bacilli were found in these).

Abdomen.

The Gut was not examined throughout, but portions of intestine which were examined contained no sign of tubercle; it however appeared somewhat congested, and the mesenteric glands, though they showed no signs of tubercle, were much pigmented.

The Spleen, Liver and Kidneys appeared at first sight to be normal except that the central parts of the lobules of the liver were yellowish; but on careful search being made a few small whitish spots were found in all three organs, forming in the kidney in some cases a radial streak in the cortex. These little spots were hard and were easily shelled out of the softer tissue around.

Suprarenals.—Normal.

Pancreas, Uterus, Ovaries, Tongue, Tonsils, Larynx, and *Pharynx.*—Were normal.

The Seat of Inoculation and the Prescapular Gland on that side were not examined.

Microscopic Examination (Smear preparations).

Lung :

(1) *Tubercle*, Tubercle bacilli.

(2) *Emulsion used for guinea-pig.*—Tubercle bacilli fairly numerous.

Kidney.—Emulsion used for Guinea-pig.—Tubercle bacilli very scanty.

Liver Emulsion used for Guinea-pig.—1 Tubercle bacillus seen.

Liver, a crushed white Speck.—No Tubercle bacilli.

Gland in Portal fissure.—Tubercle bacilli numerous.

Spleen, crushed Tubercle from.—Tubercle bacilli fairly numerous.

Scrapings from Vascular Vegetation on :—

Diaphragmatic Pleura.—(*a*) No Tubercle bacilli—(*b*) No Tubercle bacilli—(*c*) ? 1 Tubercle bacillus.

Pericardium.—No Tubercle bacilli.

Guinea-pigs Inoculated.

All intraperitoneal.

No. 22, from liver, died of general tuberculosis in 84 days.

No. 223, from spleen, died of general tuberculosis in 24 days.

No. 224, from kidney, died of general tuberculosis in 24 days.

No. 225, from lung, died of general tuberculosis in 30 days.

COW 40.

Intramammary—Inoculation of culture from the original material of Virus B. I. through Guinea-Pig 14.

Dose—Not estimated. Total volume of emulsion of culture injected 10 cc.

Date—September 30th, 1902.

Killed—December 31st, 1902. 92 days after inoculation.

Clinical History.

The cow was inoculated in the left-fore and right hind quarters of the udder on September 30th, 5 c.c. of the emulsion being injected into each.

Ten days later a little knotty induration could be felt at the root of the nipples when the mammary gland was empty. There was no alteration in the general health or appearance of the animal. A month after the commencement of the experiment the inoculated quarters were definitely enlarged and hard. The enlargement gradually increased and by the second month the right-fore quarter was also indurated. There was no marked alteration in health.

The cow gave birth to a calf (Calf 38) 132 days before inoculation and suckled it from October 18th till the day on which she was killed 74 days later.

Temperature.

There was very little variation from the normal temperature. It fluctuated between 38·6 and 39·5, on only two or three occasions rising above 40.

Weights.

September, December 31st—5 cwt. 3 qrs. 13 lbs.

POST-MORTEM EXAMINATION.

Udder :

Right Hind Quarter.—Cut open in median line; measured $10\frac{1}{2}$ in. by $10\frac{1}{2}$ in.

Wholly tuberculous; no normal tissue left; was caseating all over and calcareous nearly all over.

Sinuses were much dilated and studded with tuberculous nodules like bunches of currants, extending to tip of nipple. No ulceration; tissue very tough and dense.

Right Fore Quarter.—Apparently normal. A few opaque white nodules, merely milk cysts. Ducts and sinuses apparently normal.

Left Fore Quarter.—Wholly tuberculous, caseating and calcareous. Milk sinuses were dilated, studded with tubercles like the other; very dense round ducts.

Left Hind Quarter.—Apparently normal.

Supramammary Gland (Right) 9 in. by 5 in. Weight, 2 lbs. 3 oz.

Hæmorrhages on anterior median surface in connective tissue.

Wholly tuberculous, caseous, and calcareous. Much œdematous tissue in hilum.

Left: 6 in. by $4\frac{1}{2}$ in. Weight, 1 lb. 10 oz.

Also wholly tuberculous, caseous and calcareous. Layer of gelatinous œdematous tissue in hilum.

Glands :

Right and Left Popliteal.—Normal.

Inguinal.—Normal.

Right Iliac.—Weighed 5 oz. Miliary tubercles throughout.

Left Iliac.—$5\frac{1}{2}$ in. by 5 in. $1\frac{1}{2}$ in. thick. Weighed 1 lb. 4 oz. Tuberculous, caseating and calcareous throughout. Much œdematous tissue in hilum.

Right and Left Axillary.—Normal.

Lumbar.—Normal.

Submaxillary Lymphatic.—Normal.

Pharyngeal.—Normal.

Mesenteric.—Several examined; all found normal.

Œsophageal.—Apparently normal.

Hepatic.—Normal.

Mediastinal.—Anterior and posterior. No visible tubercles.

Bronchial.—Two tuberculous nodules, yellowish white on section, about 2 mm., found on cortex of one gland.

Lungs :

Left.—Whole lung studded with tubercles. A few caseous foci at base; less in upper lobe.

Right.—Ditto.

Heart.—Right side healthy. First part of aorta and innominate showed patches of atheroma. Left ventricle and valves healthy. Coronary arteries healthy. Calcareous atheromatous looking plaques were seen nearly all over the left auricle.

Liver, Spleen.—Normal.

Kidneys.—Normal, save for one small nodule found in cortex of each. (No tubercle bacilli found in smear).

Suprarenals.—Healthy.

Ovaries.—Normal.

Tonsils.—Normal.

Animals Inoculated.

10 to 15 cubic centimetres of the udder were emulsified with 50 cubic centimetres of salt solution, and after filtration the emulsion so prepared was inoculated into 2 Heifers, 1 Cow, and 2 Guinea-pigs

One Heifer (No. 30), received 10 c.c subcutaneously, the other (No. 26), 10 c.c. intravenously; the cow was inoculated with 10 c.c. in each of two quarters.

The two Guinea-pigs received 1·0 c.c each, one subcutaneously, the other intraperitoneally. They died of general tuberculosis in 107 and 45 days respectively.

CALF 38.

Feeding Experiment—Suckled by its mother, Cow 40, from October 18th until December 31st, 1902, a period of 74 days.

Age—At the beginning of the experiment, 5 months.

Killed—In good health, December 31st, 1902, 74 days after the experiment began.

ABSTRACTS OF POST-MORTEM NOTES.

One Peyer's patch 45 feet from the pylorus showed three small ulcers; two mesenteric glands were caseating and calcareous and several presented caseous foci. There was no sign of tuberculosis elsewhere.

NOTE.—The full post-mortem notes on this animal are given in the "Report on Feeding Experiments with the Bovine Tubercle Bacillus," page 678.

GUINEA-PIGS INOCULATED WITH MILK OF COW 40.

NOTE.– Eight guinea-pigs inoculated with the milk of the cow before her inoculation (two from each quarter) were killed and found perfectly healthy.

Doses: 30 c.c. milk from each quarter were centrifugalised and the deposit inoculated into two guinea-pigs, one subcutaneously, the other intraperitoneally.

DATE.	No. of Guinea-pig and Quarter of Udder.	Weight in Grammes.	Killed or Died.	Length of Life in days.		Result.
				Intrap.	Subcut.	
October 14, 1902 (14 days after the cow was inoculated)	192 } RF.	470	K		121	H.
	193	380	K	121		H.
	194 } LH.	420	K		121	H.
	195	400	K	121		H.
	196 } LF.	480	K		123	G.T.
	197	560	D	84		G.T.
	198 } RH.	450	D		59	T.
	199		D	88		G.T.
October 28, 1902 (28 days after inoculation)	210 } RF.	490	K		109	H.
	211	530	K	109		H.
	212 } LH.	520	D		13	No T.
	213	500	K	109		H.
	214 } LF.	510	D		22	S.T.
	215	400	D	71		G.T.
	216 } RH.	410	K		109	T.
	217	510	D	21		G.T.
November 11, 1902 (42 days after inoculation)	226 } RF.	340	K		97	H.
	227	380	D	8		No T.
	228 } LH.	350	K		97	H.
	229	370	K	97		H.
	230 } LF.	420	K		97	G.T.
	231	400	D	26		T.
	232 } RH.	400	K		97	T.
	233	470	D	78		G.T.
December 2, 1902 (63 days after inoculation)	246 } RF.	360 gr.	K		89	H.
	247	365	K	89		H.
	248 } LH.	350	K		89	H.
	249	340	K	89		H.
	250 } LF.	380	D		84	G.T.
	251	430	D	49		G.T.
	252 } RH.	390	D		72	G.T.
	253	370	D	29		G.T.

Explanation of Abbreviations.

H.—Healthy.
No T.—No tuberculosis.
S. T.—Slight tuberculosis.
T.—Tuberculosis not so extensive as G.T.
G. T.—General tuberculosis.

RHESUS MONKEY 10.

Subcutaneous—Inoculation of culture from Guinea-Pig 14. (Inoculated with original material of Virus B. I.)

Dose—Not estimated, about 0·25 cc. of emulsion used to inoculate Cow 40 and Heifers 10 and 12.

Date—September 30th, 1902.

Died—December 13th, 1902. 74 days later.

Clinical History.

The monkey was inoculated subcutaneously in both ears on September 30th, 1902; the intention was to make an intravenous inoculation, but this failed.

Small ulcers appeared at the seats of inoculation, the first being seen on October 15th, and the lymphatic glands under the ears enlarged, softened, and finally ulcerated.

The temperature rose slowly. The general health appeared quite good until a few days before death and the animal was always active, lively, and eager for food. On December 6th, the temperature, which for about a month had usually varied between 105° and 106°F., began to fall quickly. It reached 99° on December 11th, and 83°F. on December 13th. On this date the monkey died. Tuberculin Test, October 15th, 1903, 15 days after inoculation. Negative.

POST-MORTEM EXAMINATION.

On the back of the right pinna there was an irregular ulcer measuring ¾ ins. by ½ in. and continuous below with a linear ulcer 1 in. long extending to the lower end of the incision previously mentioned. The surface was covered with a dry scab, The edges were puckered up, as if healing were in progress.

Immediately behind the lobule, on the mastoid process. was a soft swelling, 1 in. by ½ in.

On the back of the left pinna there was a much smaller ulcer, about ½ in. in its longest dimension, and over the mastoid a soft prominent swelling as large as a big pea.

On the right side of the neck were four submaxillary glands, caseous and softened. In the posterior triangle there was another smaller one. The glands along the great blood vessels were normal. The right axillary gland was caseous and softened and as large as a bean.

The left axillary gland was normal.

Thorax:

Lungs.—The dorsal half of the posterior lobe of the right and the ventral half of the posterior lobe of the left lung were entirely solidified, dense, and caseating. There was a rather sharp line of demarcation. The rest of each lung was studded here and there with small separate tubercles.

Bronchial Glands.—The glands at the bifurcation of the trachea were greatly enlarged and extensively caseated; one of the glands was nearly 1 in. in length.

The Pleura was free from tubercles.

Abdomen:

The Omentum showed a few small tubercles and a large number of minute grains, possibly also tubercles.

Peritoneum.—There were fairly numerous small tubercles on the peritoneal surface of the diaphragm. The rest of the peritoneum was normal.

Intestines.—A single mustard seed sized tubercle was found in the ileum 1 foot from ileo-coecal valve and four or five feet from pylorus; except for this, the mucous membrane of gut was entirely healthy. No intestinal parasites were found.

Mesenteric Glands.—One showed minute opaque foci, (?) tubercles.

The Ileo-Colic Glands.—Appeared generally swollen but showed no sign of tubercle.

The Spleen was little if at all enlarged. It was full of tubercles of various sizes from a small pinshead up to a pea. The largest were entirely softened.

The Liver, probably about its normal size, showed numerous minute tubercles and others varying in size from these up to that of a very small pea. The larger ones were caseous and softened.

Portal Glands.—In the hepatic fissure were several glands, caseous and softened.

Both *Kidneys* were pale and had a few small tubercles in the cortex.

The Suprarenal Bodies were normal.

Pancreas and Testes were normal.

The Pharynx, Tongue, Palate, Tonsils and Larynx were normal.

The Brain and its Membranes were normal in appearance.

Microscopical Examination (Smear preparations.)

Meso-Colic Gland.—No tubercle bacilli.

Omentum ? Tubercle.— ? 1 tubercle bacillus.

Hepatic Lymphatic Gland.—Tubercle bacilli, few.

Bronchial Lymphatic Gland.—Tubercle bacilli, few.

Liver Emulsion injected into Guinea-Pigs.—Tubercle bacilli.

Spleen Emulsion injected into Guinea-Pigs.—Tubercle bacilli.

Lung Emulsion injected into Guinea-Pigs.—Tubercle bacilli, few.

Mastoid Gland Emulsion injected into Guinea-Pigs.—Tubercle bacilli, scanty, in groups.

Guinea-pigs Inoculated.

Guinea pigs inoculated from the lung, spleen, liver and a mastoid gland all developed tuberculosis.

COW 74.

Intramammary—Inoculation of an emulsion of the mammary gland of Cow 40.

Dose—Not estimated. [Total volume of emulsion injected 20 cc.].

Date—December 31st, 1902.

Died—October 26th, 1903. 299 days after inoculation.

Clinical History.

The cow was inoculated on December 31st, 1902, by an intramammary injection of an emulsion made from the mammary gland of Cow 40. The number of bacilli contained in the dose given was not estimated.

At the time of inoculation the cow was suckling a calf to which she had given birth about three weeks previously (*see* Calf 84). This calf was not allowed to suckle for a period of 24 hours after the injection, but then returned to its mother. It died a week later, when another calf (Calf 86) was given to her to take its place.

The experiment with Cow 74 extended over a period of nearly ten months, the disease produced in the animal being of a chronic type and only becoming acute about six weeks before death. Till about the middle of February no obvious change in the condition of the infected quarters of the udder was noticed. Ten weeks after the inoculation both quarters were slightly enlarged and indurated; and the supramammary gland was rather larger than normal. The enlargement of the infected quarters and of the mammary gland as a whole increased slightly, but at no time was very marked, and about six months after the commencement of the experiment began to diminish. The general condition of the cow varied from time to time, but it was never ill during the first eight months. In the beginning of September it was actually improving, and attained its maximum weight. Four weeks before the end the health of the animal changed somewhat suddenly and it became ill. The temperature rose, and the pulse and respiration were increased in frequency.

During the remainder of the time the cow became rapidly worse, and greatly emaciated. The disappearance of the subcutaneous fat around the udder enabled a more accurate examination of the gland to be made, and a week before death it was noted that a distinct mass, as large as a fist, was felt in the left fore-quarter, and an indurated ridge in the centre of the udder. The left hind-quarter was much atrophied, the right fore small and the right hind small and indurated.

On the day before death the respirations were noticed to be laboured, and the weakness more pronounced, and there was some diarrhœa. On October 26th, 299 days after inoculation, the animal was found dead, having probably died in the early hours of the morning.

Weights.

	cwt.	qrs.	lbs.	
January 1st, 1903	5	2	15	
May 12th, 1903	4	3	21	(loss, 2 qrs. 22 lbs.)
September 29th, 1903	6	1	11	(gain, 5 qrs. 18 lbs.)
October 26th, 1903	4	1	21	(loss, 7 qrs. 18 lbs.)

Total loss of weight during experiment.—1 cwt. 0 qrs. 22 lbs.

Temperature.

From the commencement of the experiment to September 24th, a period of over nine months, the temperature remained normal. On September 25th it rose rather suddenly to over 40·0°C., and remained between 40 and 41·0°C. till death.

POST-MORTEM EXAMINATION.

Carcass.—Considerably emaciated.

The Udder.—With the skin and supramammary glands attached, weighed 8 lbs.; stripped of these appendages it weighed only 6 lbs. 4 oz.

The tissues surrounding the udder were not œdematous.

Both inoculated quarters felt indurated, particularly the left fore, which was affected chiefly in the part anterior to the teat.

On longitudinal section there was no sharp line of demarcation between the quarters; the gland tissue everywhere, except where tuberculous, was firm, had a dark red colour, and showed an abnormal development of interstitial connective tissue.

The normal quarters showed no visible tubercles; the left hind was very small, being the smallest of all the quarters; the mucous membrane of the milk sinuses and ducts was slightly reddened, and presented a number of little rounded soft yellowish white structures, not apparently tuberculous.

Left Fore Quarter.—Around the periphery, from the teat to the base anteriorly and internally, and for a short distance above the teat posteriorly, the gland tissue was indurated, dense and lobulated; the lobular areas were grey, yellow and caseous in the centre, and here and there contained minute calcareous grains. The tissue in the lower central parts of the quarter presented a few scattered yellow points; the central parts of the base were free from tubercles.

The Right Hind Quarter.—Contained externally a few small lobular masses as above, and in the posterior part a series of spherical nodules, which stood out from the cut surface; these were mostly discrete, and varied from $\frac{1}{4}$ to $\frac{1}{8}$ in. in diameter, but in one place four or five were grouped together; each nodule had a golden yellow margin, and a whitish yellow, slightly gritty, calcareous centre. This quarter was smaller than the left fore-quarter, and was traversed by broad bands of fibrous tissue.

The mucous membrane of the milk sinuses and the ducts of the inoculated quarters was congested and finely granular, but otherwise resembled that of the non-inoculated quarters.

The tissues around the supramammary glands were slightly œdematous.

Supramammary Lymphatic Glands.—The left weighed 7 oz.; right, 5 oz.; both glands were disc-shaped, and were about 1 in. thick. The left measured $3\frac{3}{4}$ ins. in diameter; the right $3\frac{1}{2}$ in. The tissue of the glands was soft and congested.

In the cortex of the left gland there were some irregular, firm, greyish white masses, in which could be seen on close inspection little yellowish foci; about half the cortex was affected.

The central parts of this gland contained two deep yellow caseous masses, gritty from calcification, and surrounded by a definite fibrous capsule; one of these had an irregular outline and measured $2\frac{3}{4}$ in. by $\frac{3}{4}$ in.; the other was spherical and about $\frac{1}{2}$ in. in diameter. The right gland resembled the left, but contained five yellow nodules, one a $\frac{1}{4}$ in. in diameter, the others $\frac{1}{2}$ in.; each nodule had a dense fibrous capsule.

Right Iliac Glands.—Were normal.

A single large gland on the opposite side weighed 5 ozs., and showed no naked-eye tubercles.

Abdomen.—On opening the abdomen there was a strong foul fæcal odour.

Omentum and Peritoneum.—The posterior half of the omentum, on its anterior surface, showed a number of little reddish granulations; the surface in contact with the rumen was normal.

The peritoneum covering several of the mesenteric glands was congested, and showed a number of minute grey granules. Elsewhere the peritoneum was normal.

Spleen.—1 lb. 6 ozs. Surface normal; pulp dark red and diffluent; free from visible tubercles.

Liver.—11 lbs. 15 ozs. Both surfaces normal. Tissue pale and somewhat friable; no sign of tubercle. Running through the left lobe there was a greatly thickened bile duct.

Hepatic Lymphatic Glands.—Normal.

Kidneys.—Right 1 lb. 7 oz.; left 1 lb. 5 oz. In each the capsule stripped easily; the substance was pale; no tubercle seen in any part.

Suprarenal Bodies.—Normal.

Alimentary Tract:

Left Tonsil.—Was about twice as large as the right. On section it was almost entirely occupied by tuberculous masses resembling those in the posterior pharyngeal glands.

Right Tonsil.—Contained two nodules, one 1 cm. in diameter, the other ½ cm.

The papillæ on the anterior surface of the soft palate were congested.

The mucous membrane of the fauces was very congested.

Intestines.—The mucous membrane of the intestines was softened from post-mortem changes, and congested, 6 inches or so near the pylorus being almost black in colour. Ulcers were seen in many of the Peyer's patches, particularly in those near the lower end (total number seen, fourteen): most had a diameter of half an inch, but several were half that size, and one was an inch in diameter. The floors of the ulcers were ragged and grey, the margins slightly raised, and in some cases undermined; the base was not thickened and there were no subperitoneal tubercles.

In the cæcum there were two similar ulcers ½ in. in diameter. A colic gland near one of these contained four tubercle nodules.

Left Posterior Pharyngeal Gland measured 2½ in. by 2 in. by 1¼ in.; weighed over 2 oz., and was completely occupied by dense greyish tissue interspersed with a yellow caseous meshwork.

Right Posterior Pharyngeal Gland.—Was enlarged, weighing a little over 1 oz. On section the cortex contained several nodules as above; the gland tissue was soft and congested.

Mesenteric Glands.—The majority of the mesenteric glands were greatly enlarged, some forming very prominent tumours. On section many were seen to be tuberculous throughout, resembling the left posterior pharyngeal gland. Others contained single nodules, the smallest the size of a filbert. Seventeen of the glands were affected; these altogether weighed 14 ozs.; the largest one measured 3 in. by 2¼ in. by 1½ in., and weighed 3 ozs.

A few of the colic glands contained similar tubercles.

Thorax:

Lungs.—Weighed 30 lbs. 9 ozs. They were crammed with nodules ranging in size from ¼ in. to 1 in. in diameter, and occupying either part or the whole of a lobule. The nodules were most numerous in the anterior lobes, where in many places they were confluent, forming large masses. The nodules projected slightly beneath the pleura, and had flattened surfaces with a greyish-white colour.

The lung tissue between the nodules in the anterior lobes showed areas of collapse and slight vesicular emphysema. One of the small lobes on the right side was entirely airless and sank in water; the other anterior lobes were buoyed up in water by small patches of vesicular lung. The collapsed portions were firm and dark red in colour. The nodules were not so thickly distributed in the posterior parts of the caudal lobes as in the anterior lobes, and they were surrounded by a moderate amount of crepitant lung tissue, with only a few collapsed areas.

In the interstitial tissue about the middle of the caudal lobes superiorly there were two large air-containing cavities which sent ramifications in all directions, on the left side extending into the anterior lobes.

On section the great majority of the nodules were composed of dense translucent grey tissue, containing yellow caseous patches of homogeneous consistency and not appreciably calcified; each was surrounded by a translucent marginal zone containing no yellow areas. A few of the nodules in the posterior lobe had broken down and contained thick yellow caseo-pus.

Mediastinal Glands.—Were greatly enlarged; the long posterior mediastinal gland measured 11 in. by 4 in. by 1½ in., and weighed 1 lb. 9 oz. Two glands anterior to this measured about 4 in. by 3 in. by 1¾ in., and weighed together 11 ozs.

Left Bronchial Gland.—Weighed 11 ozs.

Right Bronchial Gland.—3 in. by 2 in. by 1 in. Weighed 9 ozs.

The mediastinal and bronchial glands together weighed 3 lbs.

On section they consisted throughout of dense greyish white tissue, homogeneous in consistency, interspersed with small yellow streaks and foci; the yellow areas were not appreciably calcified.

The long mediastinal and the right bronchial glands were congested, the former slightly, the latter intensely.

Pleura.—The fringes on the parietal pleura, along the interlobular septa and margins of the lungs were congested, but not hypertrophied to any extent; they contained no tubercles.

Heart.—No naked eye tubercle. Cavities contained dark red clot and some agony clot.

Uterus, Ovaries and Fallopian Tubes.—Normal.

All the undermentioned glands were deeply congested, but showed no tubercles:—

> *Right and Left Submaxillary, Parotid, Right and Left Popliteal, Right and Left Precrural, Right and Left Ischiatic, Right and Left Gluteal, Right and Left Axillary, Right and Left Prescapular, Right and Left Prepectoral.*

Microscopical Examination.

Smears from:

Mediastinal Gland. - -	Showed numerous tubercle bacilli.
Supramammary Gland, -	
Left Tonsil - - -	

Animals Inoculated and Fed.

Two guinea-pigs, inoculated subcutaneously with an emulsion from a mediastinal gland, died of general tuberculosis in thirty-seven and forty-six days respectively; two others inoculated intraperitoneally with an emulsion from the supramammary lymphatic gland, died of tuberculosis in eleven and thirteen days respectively.

For guinea-pigs inoculated with milk, *see* tables, p. 67.

For the full notes of the animals (Calf 86, and Monkeys 62, 70, and 72) fed with the milk, *see* "Feeding Experiments with the Bovine Tubercle Bacillus."

CALF 84.

Born in the quarantine sheds at Blythwood Farm of Cow 74 on October 7th, 1902. It was removed with its mother to Walpole on October 14th.

The mother, Cow 74, was inoculated by means of an intramammary injection when the calf was a little more than twelve weeks old. The calf was removed from its mother twenty-four hours after the inoculation, and fed artificially on sterilised milk, and on January 1st, 1903, was allowed again to suckle.

On January 6th it was found to be suffering from severe dyspnœa, having apparently had some kind of fit. Chloroform was administered with good effect, but a second attack occurred, and the calf died.

POST-MORTEM EXAMINATION.

All the organs were found to be perfectly healthy. The brain was not examined.

CALF 86.

Age—$8\frac{1}{2}$ weeks.

Feeding Experiment—Suckled by its foster-mother Cow 74 for 190 days.

Killed—July 16th, 1903. 190 days after the experiment began.

ABSTRACT OF POST MORTEM NOTES.

There were two submucous nodules and one tuberculous ulcer in the small intestine; one mesenteric gland was partly caseo-calcareous and two contained each a small caseo-calcareous tubercle; the ileo-colic glands and one gastric gland were caseo-calcareous throughout; the liver contained two small caseo-calcareous nodules; other organs and glands were normal.

(For the full notes of this Animal see page 677.)

GUINEA-PIGS INOCULATED WITH MILK OF COW 74.

Note.—8 guinea-pigs inoculated with the milk of the cow before her inoculation (2 from each quarter), were found to be perfectly healthy when killed.

Doses: 30 c.c. from each quarter were centrifugalised and the deposit inoculated into two guinea-pigs, one subcutaneously, the other intraperitoneally; in a few cases the uncentrifugalised milk was used.

Date of Inoculation.	No. of Guinea-pig and Quarter of Udder.		Weight in Grammes.	Length of Life in days.		Killed or Died	Result.
				Intrap	Subcut		
January 17, 1903. (17 days after the inoculation of the cow.)	301	RF.	310		109	K	Healthy.
	302		350	109		K	Healthy.
	303	LH.	320		109	K	Healthy.
	304		290	109		K	Healthy.
	305	LF.	320		123	D	G.T.
	306		260	72		D	G.T.
	307	RH.	280		82	D	G.T.
	308		270	61		D	G.T.
February 16, 1903.	311	RF.	560		162	K	Healthy.
	312		530	162		K	Healthy.
	313	LH.	370		162	K	Healthy.
	314		520	162		K	Healthy.
	315	LF.	480		93	D	G.T.
	316		420	57		D	G.T.
	317	RH.	420		95	D	G.T.
	318		450	46		D	G.T.
March 19, 1903.	334	LF. and RH. Dose 1·0 c.c. each.	350		67	D	G.T.
	335		360		66	D	G.T.
	336		320		60	D	G.T.
	337		430		61	D	G.T.
	338		440		70	D	G.T.
	339		350		42	D	G.T.
	340		450		59	D	G.T.
	341		390	39		D	G.T.
April 3, 1903.	356	RF.	320		186	—	Healthy.
	357		390	152		D	No Tuberculosis.
	358	LH.	320		186	K	Healthy.
	359		390	186		K	Healthy.
	360	LF.	260		64	D	G.T.
	361		270	32		D	G.T.
	362	RH.	330		68	D	G.T.
	363		370	41		D	G.T.

GUINEA-PIGS INOCULATED WITH MILK OF COW 74—*continued.*

Date of Inoculation.	No. of Guinea-pig and Quarter of Udder.	Weight in Grammes.	Length of Life in days.		Killed or Died.	Result.
			Intrap.	Subcut.		
April 18, 1902.	366 RF.	280			K	Healthy.
	367	330	180		K	Healthy.
	368 LH.	370		180	D	No Tuberculosis.
	369	260	180		K	Healthy.
	370 LF.	270		94	D	G.T.
	371	250	53		D	G.T.
	372 RH.	280		78	D	G.T.
	373	370	57		D	G.T.
May 22, 1903.	411 RF.	270		146	D	No Tuberculosis.
	412	250	146		K	Healthy.
	413 LH.	300		146	K	Healthy.
	414	290	146		K	Healthy.
	415 LF.	360		60	D	G.T.
	416	340	56		D	G.T.
	417 RH.	300		55	D	G.T.
	418	250	4		D	Slight Tuberculosis.
June 29, 1903.	463 RF.	300		148	K	Healthy.
	464	360	148		K	Healthy.
	465 LH.	320		148	K	Healthy.
	466	370	148		K	Healthy.
	467 LF.	320		40	D	G.T.
	468	330	37		D	G.T.
	469 RH.	283		52	D	G.T.
	470	370	24		D	G.T.
July 28, 1903.	495 RF.	230		119	K	Healthy.
	496	280	119		K	Healthy.
	497 LH.	300		119	K	Healthy.
	498	230	119		K	Healthy.
	499 LF	280		64	D	G.T.
	500	340	40		D	G.T.
	501 RH.	310		67	D	G.T.
	502	300	29		D	G.T.
September 11, 1903.	554 RF.	310		97	K	Healthy.
	555	310	97		K	Healthy.
	556 LH.	310		39	D	No Tuberculosis.
	557	220	97		K	Healthy.
	558 LF.	300		64	D	G.T.
	559	310	26		D	G.T.
	560 RH.	280		28	D	G.T.
	561	250	26		D	G.T.

Guinea-pigs inoculated with Milk of Cow 74—*continued.*

Date of Inoculation.	No. of Guinea-pig, and Quarter of Udder.		Weight in Grammes.	Length of Life in days.		Killed or Died.	Result.
				Intrap.	Subcut.		
October 6, 1903.	621	LF. and RH. mixed dose 1·0 c.c. each.	140	13		D	T. Tuberculous; Lungs not affected.
	622		130	15		D	T.
	623		340	30		D	G.T.
	624		320	21		D	G.T.
	625		320		57	D	G.T.
	626		330		51	D	G.T.
	627		770	17		D	Tuberculous; lungs not affected.
	628		700	21		D	G.T.
October 22, 1903.	643	RF. (0·25 c.c.) each	270		75	K	G.T.
	644		160	19		D	G.T.
	645	LH. (0·5 c.c.) each	390		75	K	G.T.
	646		200	75		K	G.T.
	647	LF. (1·0 c.c.) each	300		42	D	G.T.
	648		270	15		D	G.T.
	649	RH. (0·25 c.c.) each	220		45	D	G.T.
	650		270	25		D	G.T.

HEIFER 26.

Intravenous—Inoculation of an emulsion made from the mammary gland of Cow 40.

Dose—10 cc. (number of bacilli not estimated).

Date—December 31st, 1902.

Weight—5 cwts 2 qrs. 24 lbs.

Age—1 year 8 months.

Killed—April 25th, 1903. 115 days after inoculation.

Clinical History.

The heifer was inoculated intravenously on December 31st, 1903.

A small tender swelling developed at the site of the inoculation puncture on the jugular vein; this became reduced in size, and on March 4th, 1902, could just be felt as a slight thickening.

The general health of the animal was unaffected by the inoculation.

The temperature rose to 40·2° C. on the second day, and fell to the normal on the fifth; it then remained normal until the end of the experiment.

Tuberculin Tests.

February 25th, 1906. 56 days after inoculation Positive. Rise of temperature 2·7°C.

April 23rd, 1903. 113 days after inoculation Positive. Rise of temperature 2·2°C.

Weights.

During the first month there was a gain in weight of 20 lbs.; in the fifth week there was a loss of 7 lbs.; from the sixth to the eighth week there was a gain of 1 qr. 5 lbs. from the eighth to the twelfth the animal lost 18 lbs., subsequently there was a steady increase in weight.

	cwt.	qrs.	lbs.
January 1st, 1903 - - -	5	2	24
January 27th, 1903 - - -	6	0	16
February 3rd, 1903 - - -	6	0	9
February 24th, 1903 - - -	6	1	14
March 24th, 1903 - - - -	6	0	24
April 21st, 1903 - - - -	6	2	21

Gain in weight during the experiment.—3 qrs., 25 lbs.

POST-MORTEM EXAMINATION.

Carcass extremely well nourished.

Lungs.—Sparsely scattered throughout normal lung tissue were firm discrete nodules, varying in size from a pinhead to a pea; some of these projected prominently from the surface, especially over the superior surface of the left anterior lobe, and the outer and diaphragmatic surfaces of the right posterior lobe; the nodules on the diaphragmatic surface, and likewise a few on the outer surface of the latter lobe, were surmounted by short delicate vascular tufts.

The nodules were dark grey and translucent around the periphery and yellowish in the centre. On section they stood out prominently from the lung tissue; the yellow centre was dense and caseous, and in the larger nodules could be fairly easily shelled out.

Two inches behind the anterior extremity of the right anterior lobe and to its outer surface was a prominent tumour, flattened on its pleural surface and projecting about one-eighth of an inch; it measured one and a half inches in length, one and a quarter inches in breadth and an inch in thickness.

On section it had a well-developed fibrous capsule, and consisted of dense fibrous tissue surrounding variously sized (the largest about the size of a pea) yellow softened areas.

Bronchi.—Normal.

Mediastinal Glands.—The glands in the anterior part of the dorsal mediastonium seemed greatly enlarged, all on section showed yellow caseous nodules, one having several, the others three and four; one of the latter was slightly calcareous.

Posterior Mediastinal Gland.—Was not obviously enlarged; on section, in the cortex, but not projecting on the surface, were six yellow caseous tubercles.

Left Bronchial Glands.—Contained similar tubercles.

Right Bronchial Gland.—Was enlarged, and measured 1½ in. by 1½ in. by 1 in. Projecting from the surface was a yellow irregular nodule ¼ in. in diameter; the vessels in the capsule were congested; on section there were yellow caseous areas and a cavity ½ in. in diameter, containing thick, tenacious, greyish yellow pus.

One Small Œsophageal Gland.—Showed two caseous tubercles.

On the Parietal Pleura.—Along the intercostal spaces, particularly on the right side, were rows of pinkish, vascular, slightly elevated, villous-like vegetations. On cutting through them there was no underlying evidence of tubercle.

Similar vegetations were seen on the pleural surface of the diaphragm, at the junction of muscle and tendon.

Heart and Pericardium.—Normal.

Omentum, Peritoneal Surface of Diaphragm.—Normal.

Liver.—Through the capsule and throughout the liver substance were seen numbers of minute yellow specks similar to those seen in the liver of Heifer 30, but smaller and less numerous. With the exception of these the liver was normal.

Kidneys.—Each weighed 12 ozs. Normal on the surface and on section.

Spleen.—Weighed 26 ozs. No macroscopic evidence of tubercle.

Tongue, Tonsils, Pharynx, Larynx, Trachea, Intestines, Mesenteric Glands, Udder, Supramammary Lymphatic Glands, Ovaries, Fallopian Tubes and Uterus.—Normal.

Various Lymphatic Glands:

Right and Left Precrural, Right and Left Popliteal, Right and Left Axillary, Right and Left Prescapular, Left Cervical, Iliac.—Normal.

Microscopic Examination.

Smear preparations were made from :—

Right Bronchial Gland, Posterior Mediastinal Gland, Small Tubercle from Lung, Large Tumour from Right Lung, Liver, Vegetations on Diaphragm and Parietal Pleura.

In none of the films were tubercle bacilli found, although diligently sought for.

Animals Inoculated.

Three guinea-pigs were inoculated each with 1 cc. of an emulsion made from six tubercles removed from a left bronchial gland, two subcutaneously and one intraperitoneally; all died of general tuberculosis, the first two in 73 and 55 days respectively, the third in 79 days.

HEIFER 30.

Subcutaneous—Inoculation of an emulsion made from the mammary gland of Cow 40.

Dose—10 cc. (number of bacilli not estimated).

Date—December 31st, 1902.

Weight—5 cwts. 1 qr. 26 lbs.

Age—1 year 8 months.

Killed—April 25th, 1903. 115 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously in the left flank.

On February 10th, 1903, 41 days after inoculation, there was a hard spherical swelling measuring about 3½ in. in diameter; the precrural gland just above it was hard, prominent, and about 3½ in. in length. The tumour increased in size, and on March 4, 1903, measured 6 in. by 4½ in. by 3 in.; it was very hard and heavy and slightly tender to the touch; the skin over the posterior part showed a small superficial ulcer; the precrural gland measured 4 in. in length by 3 in. in breadth. Subsequently both the tumour and the gland diminished in size.

During the month of February the heifer showed slight signs of illness; her appetite was not good and she became distinctly thinner; movement of the left hind leg appeared to cause her pain; during the first 3 or 4 days in February she was constantly shivering.

In March her condition began to improve; she slowly increased in weight, and when killed on April 25th, 1903, appeared to be in moderately good health.

Tuberculin Tests.

February 25th, 1903, 56 days after inoculation. Positive. Rise of temperature, 2·4° C. There was a well-defined œdematous swelling at the seat of inoculation; there were also marked constitutional symptoms—increased respiration, rigors, etc.

March 23rd, 1903, 82 days after inoculation. Positive. Rise of temperature, 2·7° C.

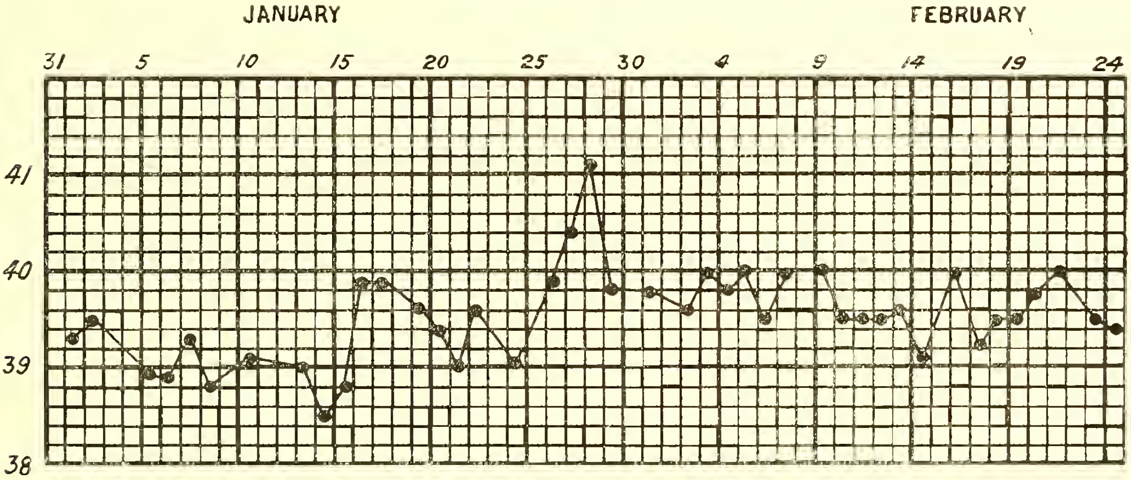
Weights.

During the first month the heifer gained 16 lbs. in weight; from January 27th to March 4th there was a loss of 105 lbs.; during the rest of the experiment there was a slow gradual increase in weight.

	cwt.	qrs.	lbs.
January 1st, 1903 - - - -	5	1	26
January 27th, 1903 - - -	5	2	14
March 4th, 1903 - - - -	4	2	21
March 21st, 1903 - - - -	4	3	17

Loss in weight during the experiment.—2 qrs. 9 lbs.

Temperature.



During the remainder of the experiment the temperature was normal.

POST-MORTEM EXAMINATION.

General Condition.—Slightly emaciated.

Local Lesion.—The local lesion was globular, and adherent to the skin. In one part there was a scab.

On section the local lesion measured 5 in. long by over 2 in. deep, and showed a central cavity 3 in. by 1½ in., containing thin liquid and an almost completely separated slough of yellow caseous matter. Surrounding the cavity was very thick connective and muscular tissue, in which were numerous discrete caseous tubercles.

Left Precrural Gland.—Was greatly enlarged, and measured 4 in. by 3 in. by 2½ in. In front of it was another smaller gland measuring 1½ in. by 1 in., which on section showed three or four largish nodules of caseous tubercle in the cortex. The large gland on section was completely occupied by caseous matter, which in parts was gritty.

Thorax:

Lungs.—In the lung tissue could be felt several large masses of tubercle, some forming a projection on the surface. On section they were grape-like masses, caseous, and surrounded by fibroid tissue. Some of these nodules on section were an inch in diameter, others were quite small. The lung tissue in between the nodules was normal. The nodules were only sparsely scattered through the lung substance. All were discrete on section, some standing out from the lung tissue.

Pericardium.—Normal in appearance.

Valves and Muscle Substance of Heart.—Normal.

Posterior Mediastinal Gland.—Was not obviously enlarged. On section there were seen three or four nodules of tubercle, one of which was half an inch in diameter. A small gland in front of this was normal. Another small gland in front of the latter was also normal.

Other small glands along œsophagus: of these one showed two nodules of tubercle, another showed one: the rest were normal.

Left Bronchial Gland.—Showed on section several nodules of caseous tubercle in the cortex.

Right Bronchial Gland.—Also showed on section nodules of caseous tubercle in parts.

Abdomen:

Omentum.—Normal.

Liver.—The liver showed on its under surface two projecting nodules, which on section were seen to be composed of a fibrous wall and caseous interior.

On the upper surface of the liver were two nodules, similar to those on the lower surface.

On section the liver substance showed numerous small tubercles, showing through the capsule as white specks.

Portal Glands.—The glands in the hilum of the liver showed no tubercles.

Spleen.—Weighed 1 lb., 12 oz.; it was somewhat enlarged, and showed some projecting nodules, which on section were caseous, with calcareous particles. Many of these could be felt throughout the substance of the spleen.

Kidneys:

Right.—Normal on surface and on section.

Left.—Normal.

One Suprarenal Lymphatic Gland.—Normal.

Alimentary Tract:

Tongue, Tonsils, Larynx and Trachea, and Posterior Pharyngeal Gland, Oesophagus.—Normal.

Small Intestine.—In the small intestine, near the cæcum, was a small erosion of the mucous membrane, measuring $\frac{3}{4}$ in. by $\frac{1}{2}$ in.; effused blood in the base and margin; no thickening of the edges or base. The peritoneum over it was normal, and there were no tubercles.

Large Intestine.—Normal.

Mesenteric Glands.—Normal.

Cervical Glands.—Beneath the skin of the right neck was a gland about 1 in. long, $\frac{1}{2}$ in. broad, which on section showed caseous tubercle throughout.

Mamma.—The mamma on section exuded thin, milky fluid and soft white masses which looked like clots of casein.

Supramammary Lymphatic Glands, Ovaries, Uterus and Fallopian Tubes.—Normal.

Various Lymphatic Glands:

Right and Left Prescapular, Right and Left Gluteal, Right and Left Axillary, Right and Left Popliteal, Right Precrural.—Normal.

Microscopic Examination.

Smear preparations were made from:—

Local Tumour, Precrural Gland (Emulsion), Lung, Liver, Spleen, Anterior Mediastinal Gland.

A few tubercle bacilli were found in the emulsion from the precrural gland, but in no other preparation.

Animals Inoculated.

An emulsion was prepared from the precrural gland and inoculated into a Jersey Calf and Heifer and a Shorthorn Heifer, the dose in each case being 10 c.c. equivalent to 116,600 tubercle bacilli.

Four guinea-pigs were inoculated with 1·0 c.c. of the same emulsion; all died of general tuberculosis in from 50 to 91 days.

HEIFER 28.

Subcutaneous—Inoculation of an emulsion made from the precrural gland of Heifer 30.

Dose—116,660 tubercle bacilli in 10 cc. of emulsion.

Date—April 25th, 1903

Age—2 years.

Killed—September 5th, 1903. 133 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck on April 25th, 1903.

Three days after inoculation there was a slightly raised œdematous swelling 4 in. by 3 in. ; this gradually decreased in size and for some time there was a small, indefinite thickening. On June 20th, 54 days after inoculation, no tumour could be felt at the seat of inoculation. The prescapular gland was difficult to palpate on account of the large amount of surrounding fat, but in the early part of the experiment was a little enlarged. There was no alteration in the general health of the animal during the experiment, and the temperature remained normal throughout.

Weights.

During the first fortnight there was a slight loss in weight ; then for ten weeks the weight fluctuated ; subsequently there was a steady gain.

	cwt.	qrs.	lbs.
April 28th, 1903 - - - - -	5	1	27
May 12th, 1903 - - - - -	5	1	18
June 2nd, 1903 - - - - -	5	2	1
June 9th, 1903 - - - - -	5	3	7
July 21st, 1903 - - - - -	5	2	22
September 1st, 1903 - - -	6	1	10

Gain in weight.—3 qrs. 11lbs.

Average gain per week.—5·29 lbs.

POST-MORTEM EXAMINATION.

Condition.—The carcass was in very good condition, and there were large deposits of fat everywhere, particularly around the kidneys and in the omentum and mesentery.

At the seat of inoculation of the tuberculin on the right side of the neck (tuberculin inoculated thirty-six hours previously) there was a well defined œdematous swelling seven inches long, three and a half inches broad, and nearly an inch thick.

Local Lesion.—At the seat of inoculation of the emulsion on the left side of the neck no tumour could be seen or felt. After reflecting the skin from the whole of the left side of the neck, careful search in the subcutaneous tissues failed to reveal the smallest tuberculous lesion.

Left Prescapular Gland.—Weighed 1 oz. and measured 2 in. by 1½ in. In the cortex at one extremity of the gland were felt two hard nodules the size of swan shot. The nodules were preserved for inoculation into guinea-pigs, and when subsequently cut into showed yellow caseous centres with calcareous points.

Right Prescapular Gland.—Was enlarged, and weighed two ounces. On section the tissue was oedematous, and presented in the cortex numerous petechial hæmorrhages.

Right Prepectoral Gland.—Was similarly enlarged. Around the two latter glands there was a considerable amount of oedema fluid.

Thorax.

Lungs.—Both posterior lobes showed beneath the capsule and evenly distributed throughout the substance numerous small petechial hæmorrhages.

On the superior surface of the left posterior lobe there projected two dark pea-sized nodules with yellow caseous centres; a similar but smaller tubercle was seen on the anterior surface.

In the middle of the left posterior lobe there was a firm mass weighing 4 ozs. (when freed from surrounding lung) and measuring 3¼ in. by 1¾ in. by 1½ in. On section the whole tumour was composed of yellow caseous material divided into lobules by fibrous septa : much of the caseous tissue had undergone great softening ; in the still unsoftened parts calcareous particles could be left. Surrounding the whole mass was a thin fibrous capsule.

In the immediate neighbourhood of the tumour there were two small shotty tubercles.

On the diaphragmatic surface of the right posterior lobe there was a dark tubercle, the size of a small pea, with a yellow caseous centre.

The cephalic and right middle lobes were normal.

The Long Mediastinal Gland.—Weighed 2¼ ozs., and had at its anterior end two spherical nodules, a large one 1¼ in. in diameter, and a small one ¾ in. in diameter. On section the nodules were entirely composed of yellow caseo-calcareous substance. The posterior half of the gland was normal.

The gland in front of this had a caseo-calcareous nodule 1 in. by ¾ in., and a pea-sized yellow tubercle in the cortex.

A third dorsal mediastinal gland and a ventral mediastinal gland were entirely caseo-calcareous.

Left Bronchial Gland.—Formed a conspicuous irregular tumour in the arch of the aorta : freed from fat it weighed nearly 15 ozs., and measured 5 in. by 4½ in. by (about) 2 in. On section it was wholly composed of yellow caseo-calcareous material, which in the central parts of the gland had undergone softening, forming at one part a caseous abscess ¾ in. in diameter. The caseated tissue was intersected by bands of fibrous tissue.

Right Bronchial Gland.—Was deeply congested and obviously enlarged, but showed no tubercle.

Pleura, Diaphragm, Heart,—Normal.

Abdomen.

Omentum and Peritoneum,—Normal.

Liver.—Weighed 9 lbs. 14 ozs.—In various parts of the substance, chiefly close to the capsule, were a few small areas made up of minute yellow points—fatty degeneration (?).

Kidneys (each weighed 14 ozs.), *Spleen* (1 lb. 14ozs.).—Normal.

Hepatic Lymphatic Glands, Tongue, Pharynx, Tonsils, Larynx, Pharyngeal Glands, Submaxillary Glands, Gastric Glands, Mesenteric Glands, Colic Glands.—Normal.

Intestines, Mammary Gland.—Normal.

Various Lymphatic Glands, Left Prepectoral, Axillary, Cervical, Precrural, Popliteal, Iliac, Lumbar, Ischiatic, Gluteal.—No tubercle.

(The lymphatic glands in all parts of the body showed petechial hæmorrhages in the cortex ; some, as in the case of the iliac, supramammary and cervical glands, were intensely congested.)

Microscopic Examination (Smear preparations):

Emulsion of Nodules from Left Prescapular Gland, Emulsion from Left Bronchial Gland.—Tubercle bacilli.

Large Nodule from Lung.—Tubercle bacilli (?)

Small Tubercle from Lung.—No tubercle bacilli.

Mediastinal Gland.—Tubercle bacilli.

Guinea-Pigs Inoculated.

With Emulsion from Left Prescapular Gland.—Nos. 540 and 541, intraperitoneally, died of general tuberculosis in 43 and 86 days respectively.

With Emulsion from Left Bronchial Gland.—Nos. 542 and 543, subcutaneously, died of general tuberculosis 38 and 41 days respectively.

With Emulsion of Spleen.—No. 544. Killed 87 days; no tuberculosis.

SHORTHORN HEIFER 98.

Subcutaneous—Inoculation of an emulsion made from the precrural gland of Heifer 30.

Dose—10 cc. containing about 116,660 tubercle bacilli.

Date—April 25th, 1903.

Age—1½ years.

Weight—6 cwt. 1 qr. 18 lbs.

Killed—September 9th, 1903. 137 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck on April 25th, 1903.

Twenty-four days after inoculation there was a hard ill-defined swelling 2 in. in diameter. On May 29th, 34 days after inoculation, the swelling measured 3 in. by 2½ in. ; it infiltrated the muscles but the skin was moveable over it ; the prescapular gland was enlarged and hard, but could not be measured on account of the large amount of surrounding fat. Later a cord-like prolongation was felt extending from the anterior extremity ; the tumour now measured 7 in. in length by 2¾ in. in breadth. The central, thicker part of the tumour increased in width and about the middle of August began to assume a a rounded shape. On September 7th, there was a prominent hemispherical swelling 5 in. in diameter ; the prescapular gland could not be felt.

There was no alteration in the general health of the animal during the experiment and the temperature remained normal.

Tuberculin Tests.

July 8th, 1903.—74 days after inoculation. Positive. Rise of temperature 2·4° C.

September 3rd, 1903.—131 days after inoculation. Positive. Rise of temperature 2·0° C.

Weights.

During the middle fortnight of July there was a loss in weight of 19 lbs. ; otherwise there was a steady progressive increase.

	cwt.	qrs.	lbs.
April 28th, 1903 - - - -	6	1	18
July 7th, 1903 - - - -	7	2	5
July 21st, 1903 - - - -	7	1	14
September 8th, 1903 - -	8	1	7

Gain in weight.—1 cwt. 3 qrs. 17 lbs.

Rate of gain per week.—10·85 lbs.

POST-MORTEM EXAMINATION.

Carcass in fine condition ; very fat. At the seat of inoculation of the tuberculin five days previously there was still a small amount of oedema.

At the seat of inoculation of the emulsion there was a prominent hemispherical tumour 4¾ in. in diameter ; the tumour was smooth and fluctuant, and the skin was adherent over it.

On section the tumour was seen to be a thin-walled cyst, flattened where in contact with the muscle wall, containing a thick viscid light brownish purulent fluid ; the wall of the cyst was fibrous, ⅛ of an in. in greatest thickness, and was closely connected with the skin on the one hand and with the muscle on the other ; the cavity measured internally about 3½ in. by 3½ in. by 1¾ in. ; the internal surface of the cyst wall was smooth and covered in various places with a thin layer of lymph, and showed several superficial yellow entirely softened tubercles, the size of wheat grains.

Left Prescapular Gland.—Weighed 3¾ ozs., and was 4 in. long. In its upper part were some rounded cystic swellings, and yellow tubercles were seen through the capsule. On longitudinal section the cortex of the gland in the upper part was found to contain, besides several small softened yellow tubercles, five cavities, the smallest one the size of a pea, the largest an inch in diameter. The contents of the cyst were thick, yellowish white and tenacious. The wall of one of the large cysts was one ⅛ of an inch thick, the outer part being composed of fibrous tissue, the inner of pinkish granulation tissue.

The lower part of the gland was unaffected.

One Left Prepectoral Gland.—The one nearest the local lesion, was slightly enlarged, and on section showed about fifteen to twenty discrete yellow softened tubercles ; there was no calcification.

Two adjacent prepectoral glands were normal.

Right Prescapular Gland.—Weighed 2¾ ozs. On section the tissue was intensely congested and oedematous, with numerous petechial hæmorrhages scattered throughout.

Right Axillary Glands.—Showed a few petechial hæmorrhages in the cortex.

Spleen (weighed 1½ lbs.), *Liver* (weighed 13 lbs. 4 ozs.), *Kidneys* (each weighed 16 ozs.)—Normal on surface and on section.

Suprarenal Bodies.—Normal.

Lungs, Mediastinal Glands, Heart, Pericardium, Omentum, Diaphragm, Tongue, Pharynx, Tonsils, Mammary Gland, Intestines, Mesenteric Glands.—Normal.

Various Lymphatic Glands :

Cervical, Posterior Pharyngeal, Submaxillary, Right Prepectoral, Iliac, Lumbar, Precrural, Popliteal, Gluteal, Ischiatic, Hepatic.—Normal.

Microscopical Examination (Smear preparations).

From a Tubercle in the Wall of the Abscess Cavity.—A few tubercle bacilli.

Prescapular Gland.—Tubercle bacilli.

Prepectoral Gland (Emulsion).—Tubercle bacilli.

Animals Inoculated.

Four guinea-pigs were inoculated with an emulsion made from half of the left prepectoral gland ; two of these, inoculated subcutaneously, died of general tuberculosis in 46 and 48 days respectively ; the other two, inoculated intraperitoneally, died of general tuberculosis in 41 and 30 days respectively.

CALF 102.

Subcutaneous—Inoculation of an emulsion made from the precrural gland of Heifer 30.

Dose—116,660 tubercle bacilli in 10 cc. of the emulsion.

Date—April 25th, 1903.

Weight—April 25th, 1903. 2 cwts. 0 qrs. 26 lbs.

Killed—September 22nd, 1903. 150 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 25th, 1903.

On May 16th, three weeks after inoculation, there was a firm elongated tumour measuring 4 in. in length, $1\frac{1}{2}$ in. in breadth, and about $\frac{3}{4}$ in. in greatest thickness. On June 30th the tumour was a little thicker and measured $5\frac{1}{2}$ in. by $2\frac{3}{4}$ in. in superficial area ; subsequently it diminished slightly in size. The prescapular gland on June 3rd, 39 days after inoculation, measured about $4\frac{1}{2}$ in. in length and remained practically stationary in size during the rest of the experiment.

With the exception of slight diarrhœa for a few days from May 29th to June 3rd there was no disturbance in the general health ; during the first half of the experiment the calf did not appear to grow quite at the normal rate.

Weights.

During the first fortnight there was a gain in weight of 16 lbs. ; in the following three weeks there was a loss of 13 lbs., then, after a slight increase, from June 16th to July 7th, the weight remained stationary; subsequently there was a practically steady increase in weight.

	cwt.	qrs.	lbs.
April 28th, 1903 - - - - -	2	0	27
May 12th, 1903 - - - - -	2	1	14
June 2nd, 1903 - - - - -	2	1	1
June 9th, 1903 - - - - -	2	1	5
June 16th, 1903 - - - - -	2	1	14
July 7th, 1903 - - - - -	2	1	14
September 22nd, 1903 - - - -	3	1	7

Gain in Weight.—1 cwt. 9 lbs.

Average Weekly Increase.—5.6 lbs.

Temperature.

The temperature remained practically normal throughout ; the highest recorded temperature (excluding those following the inoculation of tuberculin) was 39·6° C.

Tuberculin Test.

September 11th, 1903.—139 days after inoculation Positive. Rise of temperature 1·9° C. The temperature rose to 40·8° C. and remained high for 3 days

POST-MORTEM EXAMINATION.

Carcass well nourished.

At the Seat of Inoculation.—There was a subcutaneous thickening 5 in. by 2 in. On section this thickening consisted of dense fibrous tissue, studded with numerous yellow calcareous particles ; there was little or no caseous tissue. The tumour was adherent to the skin and was $\frac{1}{2}$ in. thick. Two calcareous tubercles were situated in the muscle beneath the local tumour.

Left Prescapular Gland.—Weighed 6 oz., and measured 4 in. by $2\frac{1}{2}$ in. by 2 in. It was almost entirely caseous and very gritty from calcification ; the capsule was thick and fibrous, and dense fibrous bands passed in between the tuberculous masses.

Left Prepectoral Gland, Axillary Glands.—Normal.

At the seat of inoculation of tuberculin (eleven days previously) there was a small œdematous patch.

Right Prescapular Gland.—Weighed 2 oz. Tissue œdematous.

Abdomen.

Omentum, Peritoneum.—Normal.

Spleen.—Weighed 1 lb. 2 ozs. On both surfaces there were a few minute vascular tufts : the parenchyma contained four tubercles, two closely associated, and a third forming projections on the diaphragmatic surface. One was the size of a No. 4 shot, the others that of a small pea ; all were caseous and gritty from calcification.

Liver.—Weighed 6 lbs. 11 oz. On the anterior surface at the upper part of the sulcus between the right and left lobes, there was a congeries of small yellow foci ; the foci caused a distinct roughening on the surface, and extended over a superficial area half an inch in diameter, and a quarter of an inch into the substance of the liver. Near the inferior margin there was a yellow nodule a quarter of an inch in diameter, slightly depressed below the surface. On section it showed dense caseated tissue, gritty from calcification, surrounded by a thick fibrous capsule. In the parenchyma of the liver there were five similar nodules ranging in size from that of the one just described to a good sized shot.

Heptic Glands. — One hepatic gland showed caseo-calcareous tubercles ; two others were normal.

Right Kidney (11 oz.) ; *Left Kidney* (10 oz.).—Normal on surface and on section.

Suprarenals, Intestines, Gastric Glands, Mesenteric Glands, Colic Glands, Tongue, Pharynx, Tonsils, Trachea, Oesophagus.—Normal.

Thorax.

Lungs.—Weight 5 lbs. 4 oz. They contained about twenty nodules ranging in size from three-twentieths to three quarters of an inch in diameter ; the nodules were present in every lobe of the lung, but more numerously in the posterior. Several projected from the surface, one or two of the smaller ones being almost pedunculated ; two of the larger surface nodules were surmounted by soft vascular tissue. On section the nodules were spherical and showed a fibrous capsule enclosing dense greyish-yellow caseous substance, very gritty from calcification. Two of the nodules contained thick caseo-pus.

Thoracic Glands.—The long superior mediastinal gland showed six caseo-calcareous nodules $\frac{1}{8}$ in. in diameter, and a caseo-calcareous mass $\frac{3}{4}$ in. in diameter. The gland a little more anterior had a similar mass $\frac{1}{2}$ in. in diameter ; another gland showed about half its substance tuberculous ; one gland in this series was normal.

Right Bronchial Gland.—Was congested, and contained in the cortex a pea-sized calcareous nodule.

Left Bronchial Gland.—Had two or three similar nodules, and a mass $\frac{1}{4}$ in. in diameter.

A small gland on the trachea was normal.

Ventral Mediastinal Glands.—Normal.

Pleura.—On the upper and lower margins of the ribs there were some pale reddish villous-like growths ; no tubercles could be felt in them. Similar growths were seen on the central tendon of the diaphragm.

Heart, Pericardium.—Normal.

Testicles.—Normal.

Other Lymphatic Glands :

Right Prepectoral, Right Axillary, Posterior Pharyngeal, Right and Left Cervical, Submaxillary.—Normal.

Parotid (*Right and Left*), *Iliac* (*Right and Left*), *Lumbar* (*Right and Left*), *Precrural* (*Right and Left*), *Popliteal* (*Right and Left*), *Gluteal* (*Right and Left*) *Ischiatic* (*Right and Left*).—Normal.

Microscopical Examination (*Smear Preparations*).

Emulsion of Prescapular Gland.—A few tubercle bacilli.

A Spleen Tubercle, a Liver Nodule, a Lung Nodule, a Mediastinal Gland.—No tubercle bacilli.

Animals Inoculated.

An emulsion was made from the left prescapular gland, 4 ozs. of the gland being used ; the emulsion after filtration amounted to 50 cc.

This emulsion was used to inoculate two calves (Nos. 126 and 128) and four guinea-pigs ; the calves received each 20 cc., the guinea-pigs each 1 cc.

All the guinea-pigs died of general tuberculosis ; two, inoculated subcutaneously, in 65 and 35 days, and two, inoculated intraperitoneally, in 22 and 31 days.

A guinea-pig inoculated subcutaneously with an emulsion made from a liver nodule remained healthy.

CALF 128.

Subcutaneous—Inoculation of an emulsion made from the prescapular gland of Calf 102.

Dose—110,000 tubercle bacilli in 20 cc. of the emulsion.

Date—September 22nd, 1903.

Age—10½ weeks.

Killed—November 25th, 1903. 64 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 22nd, 1903.

Four days later there was a slightly raised swelling 2 in. by 2½ in. with a narrow prolongation from the inferior extremity; the prescapular gland was slightly enlarged. On October 13th, three weeks after inoculation, there was a triangular tumour measuring 5½ in. in greatest length, 3¼ in. in greatest width and about 1½ in. in thickness; the prescapular gland was over 4 in. in length.

The tumour continued to grow and attained a very large size; on October 30th it measured 9 in. by 6½ in. by about 5 in. in greatest thickness; it was moulded to and partly concealed a considerably enlarged prescapular gland; the dewlap and tissues around the lower part of the tumour had become very œdematous.

The tumour increased in size still further and became united to the prescapular gland.

The calf remained in moderately good health until about November 12th, 1903. On this date the respirations were noticed to be slightly increased and the appetite was poorer; the calf appeared also to have lost flesh.

The symptoms quickly became more acute; the respirations increased in frequency and finally became very laboured and there were frequent paroxysms of coughing; the calf became very weak and emaciated and was killed when very ill on November 25th, 1903.

Weights.

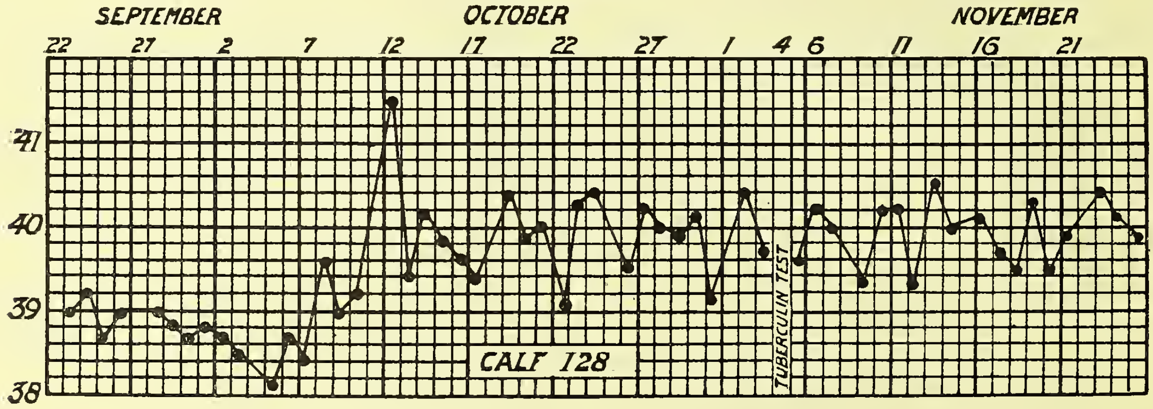
	cwt.	qrs.	lbs.
September 29th, 1903 - - -	1	0	0
October 6th, 1903 - - -	1	0	10
October 13th, 1903 - - -	1	0	5
October 27th, 1903 - - -	1	0	12
November 3rd, 1903 - - -	1	0	14
November 10 and 17th, 1903 -	1	0	5
November 24th, 1903 - - -	0	3	24

Loss in weight.—4 lbs.

Tuberculin Test.

November 3rd, 1903. 32 days after inoculation. Positive. Rise of temperature 0·9°C.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Much emaciated.

Local Lesion.—On the left side of the neck, immediately in front of the shoulder, there was a large firm tumour somewhat rectangular in shape; the skin over it was intimately adherent, and in several places was fissured and necrosed, forming hæmorrhagic scabs that could be partially detached.

On removal the prescapular gland was found to be attached to the tumour and to be partly embedded in its substance.

The tumour, with the skin and gland, weighed 4 lbs. 12 ozs. The tissues surrounding the tumour and prescapular gland were very œdematous, and contained many discrete caseous tubercles; the œdematous infiltration extended into the dewlap.

On section the tumour measured 8 in. by 7 in. by 3½ in., and showed beneath the skin, for a depth of 1½ in., dense pinkish yellow caseo-necrotic tissue containing here and there minute opaque yellow gritty points, and in the deeper parts closely set (in places confluent) nodules of tissue similar to the above, surrounded by a small amount of dense congested fibroid tissue; in the former there was near the skin a small area of commencing softening. The skin and the subcutaneous tissue were infiltrated with tubercle, congested, and here and there hæmorrhagic.

Left Prescapular Gland.—Measured 5 in. by 2½ in. by 2½ in., and weighed about 12 oz. (only half was weighed). On section the gland was caseous throughout, consisting of tissue resembling that described in the local tumour; the capsule was thickened, adherent to the tumour, and presented a number of caseous foci.

At the inferior extremity of the gland, extending from it into the dewlap, there was a mass of firm fibroid tissue (2 in. across) closely beset with confluent caseous tubercles: in the lower part of this mass a gland (prepectoral) ¾ in. in diameter was embedded; the gland on section showed a dense yellow caseous part and a broad peripheral part of more translucent tissue with caseous foci; the capsule of this gland was very thickened, contained caseous foci, and merged into the surrounding fibrous tissue.

A second prepectoral gland, flattened, 1½ in. by 1½ in., showed in the cortex very numerous discrete yellow foci and a grey caseating mass ½ in. in diameter. A third prepectoral gland showed in the cortex a caseous mass ½ in. long and a number of minute caseous foci.

Between the tumour and the prepectoral glands there were some thickened caseous lymphatic vessels; one caseous lymphatic entered the thorax.

Left Axillary Gland.—Disc-shaped, 1½ in. by ½ in., presented in the cortex a considerable number of minute discrete yellow foci.

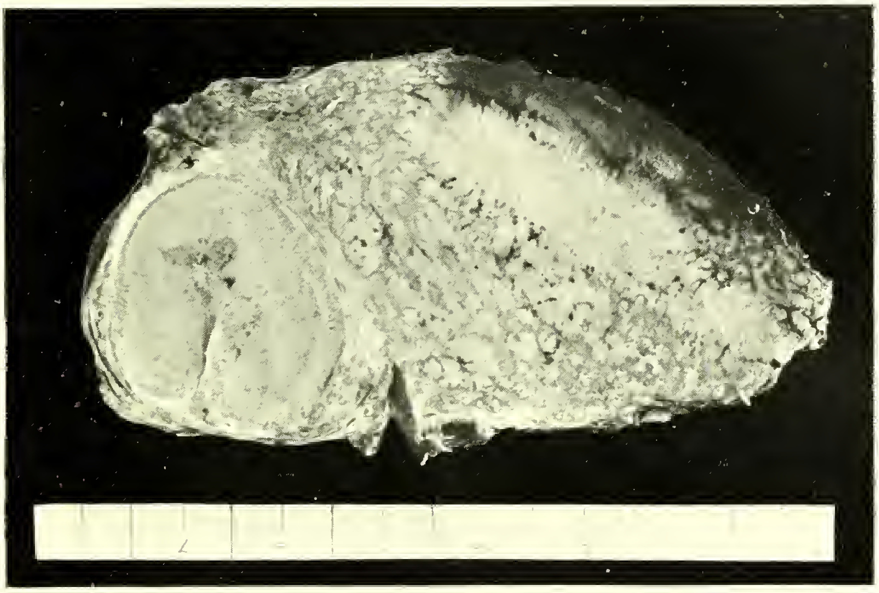
Cervical Glands.—A gland on the left side of the trachea, the size of a filbert, contained a caseous nodule and yellow foci.

Abdomen.

Omentum.—Completely devoid of fat. Vessels congested. Presented on its inferior surface a number of tubercles ranging in size from a mustard seed to a wheat-grain; the larger tubercles were sessile and caseous centrally. On the surface of the omentum, in contact with the rumen, there was a tubercle similar to the latter

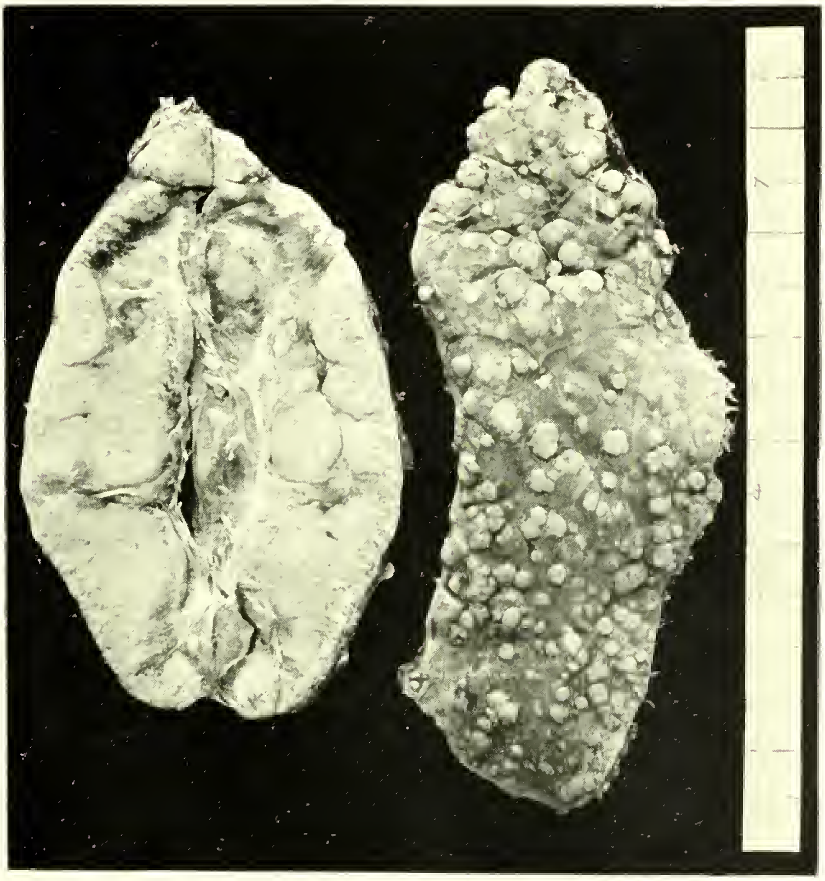
Intestines, Peritoneum.—Were hyperæmic.

Spleen.—Weighed 7 oz. The pulp was crowded with nodules ranging in size from 2 to 5 mm. in diameter. When cut into these showed a translucent periphery and a yellowish centre, one or two containing minute calcareous



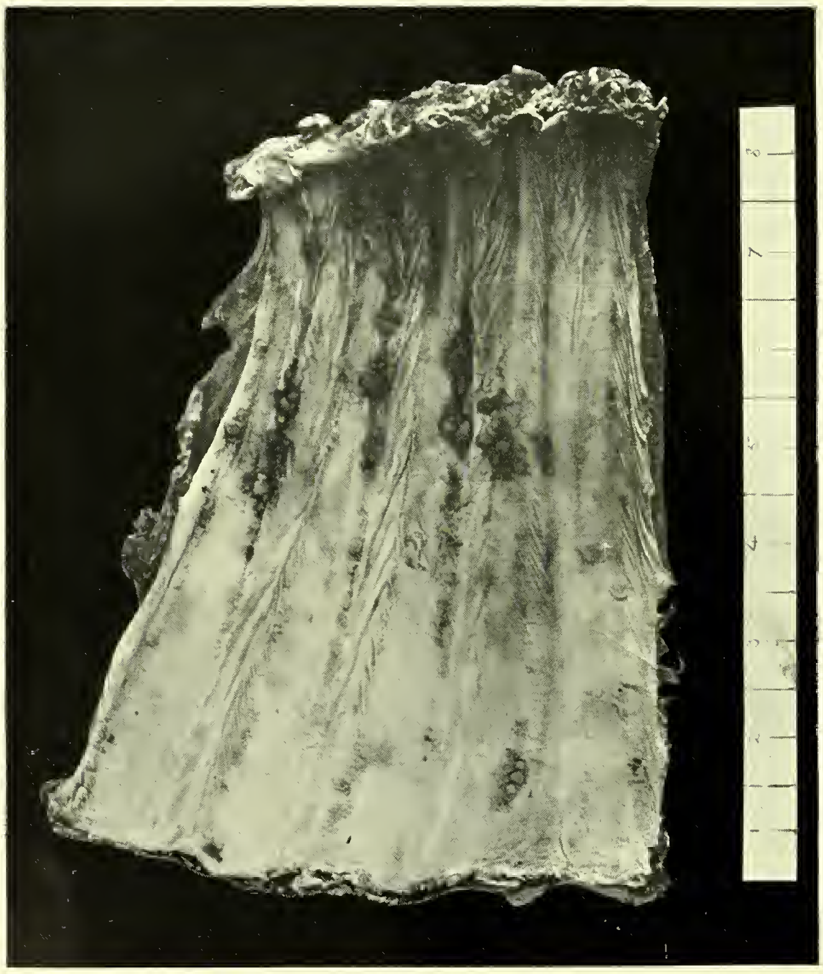
CALF 128. Subcutaneous. Virus B. I.

Local lesion and prescapular gland, in transverse section; intervening tissues thickened and infiltrated with caseous nodules.



CALF 128. Subcutaneous. Virus B. I.

Mediastinal gland, cut open, and lung (piece of small lobe), showing the projecting subpleural nodules.



CALF 128. Subcutaneous. Virus B. I.

Costal pleura, showing clusters of tubercles in the fringes along the margins of the ribs.

grains. A few of the tubercles caused rounded projections on the surface.

Liver.—5 lbs. Showed on both surfaces a considerable number of nodules resembling those in the spleen, and ranging in size from 2 mm. to 1·5 cm. in diameter; many were just seen beneath the capsule, others projected slightly, whilst a few were prominent, flattened, and mushroom-shaped.

On section numerous similar nodules were seen throughout the parenchyma. In the small accessory lobe on the right side there was a caseous mass 3 cm. in diameter. One of the large veins near this presented on its internal surface a number of small greyish yellow tubercles. Tubercles were seen in the walls of veins in other parts of the liver.

Hepatic Lymphatic Glands.—(Five in number) enlarged, weighing together 1½ oz., the two largest 2½ in. and 2 in. long respectively; surfaces nodular; showed throughout caseous masses.

Kidneys:

Left.—8 oz. Contained in the cortex several nodules numbering about one to each large lobule; they ranged in size from a millet seed to a large pea; those of the latter size projected slightly from the surface and were somewhat wedge-shaped on section. All were in a state of caseation.

Right.—7 oz. Showed on the surface about the same number of nodules as the left. Three were large and projected from the surface, but the majority were not greater than a millet seed. On radial section the larger areas were wedge-shaped, and consisted of smaller tubercles grouped together; one of these was twice the size of the others, measuring 1 cm. at its widest part, and occupying the full width of the cortex; it contained calcareous grains.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—Were everywhere beset with greyish yellow nodules ranging in size from 1 mm. up to 1 cm. in diameter, the majority being from 4 to 5 mm. In the anterior lobes, where the nodules were most numerous, those near the surface formed hemispherical projections, some of which were surrounded by grey miliary (pleural) tubercles. On the ventral surfaces of the posterior lobes, many of the surface nodules formed flattened mushroomed growths, the largest 1·5 cm. in diameter. On section the nodules were caseous, but not softened or calcareous. The anterior lobes showed large areas of collapse, and in the posterior the nodules were surrounded by a dark translucent zone. On the right side the contiguous surfaces of the small anterior lobes were glued together, but could be readily separated except at a few points where opposing nodules had become united by fibrous bands.

Pleura.—Along the margins of the ribs there was a number of caseating nodules from 2 to 3 mm. in diameter, arranged singly and in clusters.

In the fringes around the margins of the lungs there were scattered nodules similar to those on the ribs.

Diaphragm.—On the right side of the abdominal surface of the diaphragm there was a group of subperitoneal tubercles disposed in rows parallel to the fibres of the tendon; on the left side there was one similar tubercle.

On the pleural surface of the tendon of the diaphragm, especially on the left side, there was a series of mushroomed growths 1 cm. and less in diameter, similar to those on the lungs, also some soft reddish granulations.

Mediastinal Glands.—The dorsal mediastinal glands (seven in number) were considerably enlarged, and weighed together 7 ozs., the long gland (5 in. by 2 in.) alone weighing 5 ozs. On section they consisted throughout of firm caseating tissue containing here and there a calcareous grain.

The ventral mediastinal glands were enlarged, weighing together 2½ ozs., and similarly affected.

A gland within the thorax, on the left side, was tuberculous throughout.

Bronchial Glands.—Enlarged to over three times the normal; were also uniformly caseous.

A vertebral gland showed a caseous focus.

In the loose tissues at the apex of the heart there was a collection of discrete yellow tubercles.

Pericardium and Heart Muscle.—Normal.

Larynx, Pharynx, Trachea, Tonsils, Testicles and Pudic Glands.—Normal.

Intestines.—Showed no tubercle; subserous vessels congested.

Mesenteric Glands.—The mesenteric glands formed, except at the anterior and posterior ends, an unbroken chain containing here and there small caseous nodules, and grey foci; two glands at the posterior end were entirely caseous.

Gastric Glands.—A gastric gland was entirely caseous: a second one showed a few yellowish foci.

Colic Gtands.—One or two colic glands contained minute foci.

Various Lymphatic Glands:

Left Precrural.—1½ in. by ¾ in. Caseous throughout.

Right Precrural.—No obvious tubercle.

Left Popliteal.—Normal.

Right Popliteal.—Contained a caseous nodule, ⅓ in. in diameter.

Ischiatic, Gluteal.—Normal.

Iliac.—One left iliac contained a caseous nodule ¼ in. in diameter. The right iliac contained two similar, but smaller nodules. The gland at the bifurcation of the abdominal aorta contained two similar nodules.

Half a dozen hæmo-lymph glands on the left iliac artery showed no obvious tubercle.

Lumbar.—Two lumbar glands, each about the size of a broad bean, nodular on the surface, contained confluent masses of greyish tissue dotted with yellow points. Two glands posterior to these, size of kidney beans, similarly affected. Two others showed small yellow foci.

Cœliac Glands.—Anterior to the left kidney, on one of the pillars of the diaphragm, there were two glands, one 2 in. by 1⅛ in. by ⅔ in., the other the size of a Brazilian nut, caseous throughout.

Left Retro-Pharyngeal.—Contained a yellow caseous nodule 5 mm. in diameter.

Right Retro-Pharyngeal.—Showed a caseous nodule 1 cm. in diameter, and a small caseous focus.

Right and Left Submaxillary.—Normal.

Right Prescapular.—Was enlarged, and contained at its lower end a number of yellow foci.

A Right Prepectoral Gland.—Slightly enlarged: contained a number of grey foci.

Right Axillary.—Normal.

Microscopical Examination.

Numerous tubercle bacilli were found in a smear made from the emulsion of the left prescapular gland, used to inoculate guinea-pigs.

Animals Inoculated.

Four guinea-pigs were inoculated, two subcutaneously and two intraperitoneally, with an emulsion made from the left prescapular gland; all died of general tuberculosis, the first two in 34 and 53 days, the last two in 17 and 19 days.

CALF 126.

Subcutaneous—Inoculation of an emulsion made from the prescapular gland of Calf 102.

Dose—110,000 tubercle bacilli in 0 cc. of emulsion.

Date—September 22nd, 1903.

Age—10½ weeks.

Killed—November 4th, 1903. 43 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 22nd, 1903.

Four days later there was a tender puffy swelling, 4 in. by 2 in., and the prescapular gland was a little enlarged. On October 13th, 3 weeks after inoculation, there was a firm tumour, measuring 6 in. by 3¼ in. by 1½ in., to which the skin was intimately adherent; the prescapular gland was 4 in. in length.

On October 23rd the tumour had attained its maximum, 7 in. by 3½ in., and seemed to be adherent to the prescapular gland.

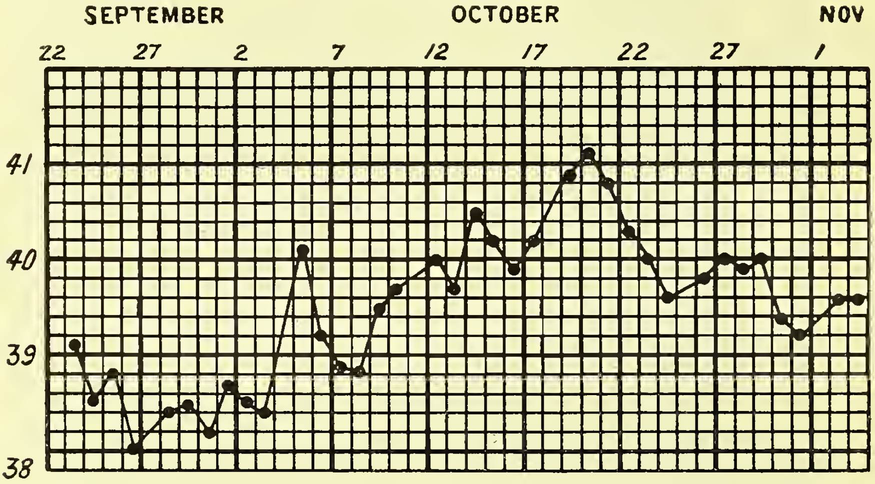
On October 20th the calf vomited immediately after food; with this exception there were no symptoms of ill-health until October 27th. On this date he was noticed to have a rough coat and a more subdued manner. During the next few days he became obviously ill and the respirations were increased in frequency. He was killed on November 4th, before he had become acutely ill, in order to supply tuberculous material to inoculate Cow 44.

Weights.

	cwt.	qrs.	lbs.
September 29th, 1903 - - -	0	3	17
October 13th, 1903 - - -	0	3	25
October 20th, 1903 - - -	1	0	6
October 27th, 1903 - - -	1	0	0
November, 3rd, 1903 - - -	1	0	3

Gain in weight, 14 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—In the subcutaneous tissues immediately external to the left prescapular gland there was a firm tumour 7 in. long by 3½ in. broad; the skin was intimately adherent, but not ulcerated.

On removing and dividing, the tumour was 1½ in. thick; the mid parts consisted of dense opaque greyish white tissue, slightly gritty from calcification; the marginal, of pink translucent tissue studded with grey caseating tubercles.

The growth involved the superficial muscle and was slightly adherent to the capsule of the gland.

The subcutaneous tissues around were œdematous.

Left Prescapular Gland.—Weighed four ounces and measured 3½ in. by 2½ in. by 1½ in. On section it consisted throughout of dense greyish tissue, presenting small opaque white foci of caseation, not appreciably calcareous.

Prepectoral Glands.—A rounded prepectoral gland on the same side was enlarged (two-thirds of an inch in diameter). On section the central part consisted of tissue resembling that in the prescapular gland. This central part was surrounded by a cortical zone, 2 mm. thick, from which it was fairly readily separated, the line of separation being marked by more opaque yellow tissue. The cortical part was translucent, grey, and contained numerous yellow foci.

A second gland, more deeply situated, showed several grey caseating masses; a third near the above was not obviously affected.

Cervical Glands.—One small gland, the size of a large pea, on the left side of the trachea, contained a caseous nodule.

Abdomen.

Peritoneum.—The inferior surface of the omentum showed about ten grey hemispherical tubercles, from 1 to 3 mm. in diameter.

Peritoneum elsewhere normal.

Spleen.—Weighed five and a half ounces. Surface normal. The pulp contained numerous nodules from 1·5 to 3 mm. in diameter. All were caseous in the centre, but not appreciably calcified.

Liver.—Weighed three and a half pounds. Scattered throughout the parenchyma were numerous nodules, from 1 to 4 mm. in diameter. Many were just visible beneath the capsule: others projected slightly. All the nodules were grey and showed central caseation. On the surface there were also about twelve greyish white flattened mushroom-like growths, 4 to 7 mm. in diameter: these extended a variable distance into the substance.

Hepatic Lymphatic Glands (four in number).—Were enlarged and filled with grey caseating nodules, many of which projected beneath the capsule.

Kidneys, Left.—Five ounces. Showed three wedge-shaped areas, one similar to those described above, the others projecting from the surface and appearing as if made up of a number of small grey tubercles. The cortex also contained four tubercles, three the size of mustard seeds and one three or four times larger.

Right.—Five ounces. On stripping off the capsule there were seen three pale areas, about a quarter of an inch in diameter. These on section were wedge-shaped and had a grey translucent homogeneous appearance. The cortex also contained five grey caseating tubercles, the size of mustard seeds ; four of these were seen on the surface, one causing a projection.

Right and Left Suprarenal Bodies.—Normal.

The Left Lumbar Gland was enlarged. The cortex showed grey masses containing yellow foci.

A gland on the right side was similarly affected. A second gland on the right side was not apparently tuberculous.

Iliac Glands.—The left iliac gland showed a small grey focus.

The glands on the right side, and those at the bifurcation of the aorta, contained no visible tubercles.

Thorax.

Lungs.—Were crammed with grey nodules, ranging in size from 1 to 5 mm. in diameter: the nodules were more numerous in the anterior lobes (particularly the right), where they were surrounded by reddish collapsed areas. The nodules were all caseous, and most had a zone of congestion around them. A few of the subpleural nodules formed small mushroom-like outgrowths on the surface: in the posterior lobes two or three single lobules were completely consolidated and showed caseous points.

In the dorsal part of the right posterior lobes, just beneath the pleura, there was a rounded firm nodule (glandular ?) 1 cm. in diameter, which on section showed grey translucent tissue containing yellow foci.

Pleura.—The fringes along the anterior margins of the posterior lobes and the posterior margins of the lobes immediately anterior contained small hard grey tubercles.

Along the margins of a few of the ribs there were similar grey tubercles.

Two grey tubercles (size of a No. 4. shot) were seen on the pleural surface of the pericardium.

Mediastinal Glands (five).—Were enlarged, weighing together six ounces. The long mediastinal gland measured 4 in. by 1½ in. With the exception of the part at the lower end the cortex was entirely occupied by dense greyish white caseous masses presenting small opaque yellow foci of beginning calcification. The glands anterior to this were similarly affected; the tissues around the glands were œdematous.

Left Bronchial Gland.—Was enlarged and weighed two ounces.

Right Bronchial Gland.—Was enlarged to about three times the normal. Both on section resembled the mediastinal glands.

Four small glands along the œsophagus contained caseous tubercles.

Heart, Pericardium.—Normal.

Tongue, Pharynx, Larynx, Tonsils.—Normal.

Left Posterior Pharyngeal Gland.—Contained a caseous congested tubercle the size of a small shot.

Right Submaxillary Gland.—Contained a similar tubercle.

Mesenteric Glands.—Eight mesentric glands in various parts of the mesentery, three at the ileo-caecal end, showed small grey tubercles.

Gastric Glands.—One gastric gland contained about half a dozen similar tubercles ; a second gastric gland contained one grey caseating tubercle.

Intestines.—Normal throughout.

Testicles.—Normal.

Various Glands :

> *Right and Left Precrural, Right and Left Popliteal, Ischiatic and Gluteal, Parotid, Left Submaxillary, Right Posterior Pharyngeal, Axillary, Right Prepectoral, Glands along Right side of Trachea.*—Normal.

At the seat of inoculation of the tuberculin on the right side of the neck (eighteen hours previously) there was a well-defined œdematous swelling 6 in. by 2¼ in. On section the subcutaneous tissues and adjacent muscles were very œdematous.

Right Prescapular Gland.—Was enlarged to over twice the normal; its tissue was very œdematous, and showed numerous petechial hæmorrhages.

Microscopical Examination (Smear Preparations).

Emulsion of Left Prescapular Gland.—Tubercle bacilli.

Tubercle from Omentum.—Tubercle bacilli.

Iliac Gland.—Tubercle bacilli.

Submaxillary Gland.—Tubercle bacilli.

Gastric Gland.—Tubercle bacilli.

Animals Inoculated.

An emulsion was prepared from the left prescapular gland and was estimated to contained 829,800 tubercle bacilli per cc.

Of this emulsion 1·22 c.c., containing approximately 1,000,000 tubercle bacilli, were inoculated into each of two quarters of the udder of Cow 44.

The same amount of emulsion was inoculated into each of two rabbits, Nos. 7 and 8, one subcutaneously, the other intraperitoneally ; the rabbits died of general tuberculosis in 116 and 82 days respectively.

A dilution of the emulsion was made so that 1 cc. contained approximately 5,000 tubercle bacilli ; four guinea-pigs were inoculated each with 1 cc. of this dilution ; all died of general tuberculosis in from 48 to 117 days.

COW 44.

Intramammary—Inoculation of an emulsion of the prescapular gland of Calf 126.

Dose—1,000,000 tubercle bacilli into each of two quarters.

Date—November 4th, 1903.

Killed—December 15th, 1903. 41 days after inoculation.

Clinical History.

The animal was inoculated on November 4, 1903, by an injection into the right hind and left fore-quarters of the udder. The emulsion used for the inoculation was made from the prescapular gland of Calf 126. The quantity of emulsion injected into each quarter was 1·22 cc., each of these doses being estimated to contain 1,000,000 tubercle bacilli.

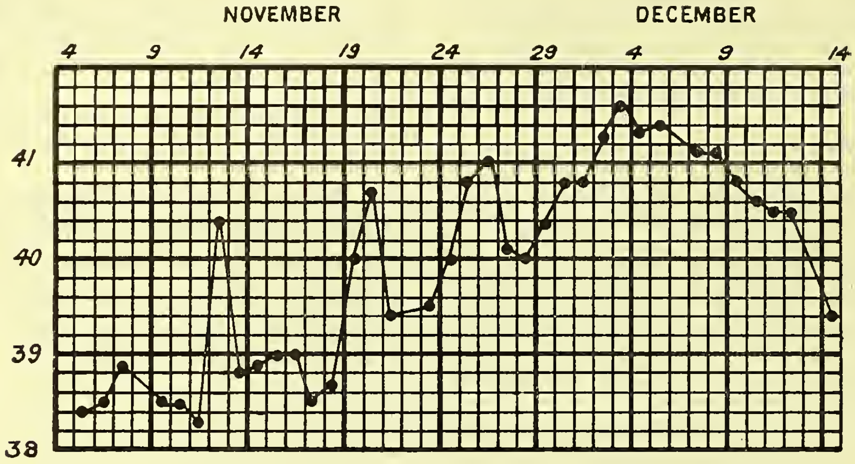
A fortnight after the commencement of the experiment the infected quarters were definitely indurated and tender, and by the end of the first month they were greatly enlarged, much indurated and œdema was noticed in front of the udder. The cow was becoming ill, its appetite poor and its weight was diminishing. The general health of the animal steadily became worse, and for some days before being killed on December 15th she was very ill and apparently dying.

Weights.

	cwt.	qrs.	lbs.
November 10th, 1903 - -	7	0	0
December 15th, 1903 - -	5	1	0

Total loss of weight during experiment.—1 cwt. 3 qrs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Somewhat emaciated.

In the subcutaneous tissues in front of the udder, and between the udder and the abdominal wall, there was a moderate amount of œdema ; between the skin and the inoculated quarters, especially about the roots of the teats, there was a considerable amount of œdema fluid.

Tortuous thin-walled vessels, distended with clear yellow serum, ramified in the subcutaneous tissues over the inoculated quarters.

Mammary Gland.—The udder, with skin and glands attached, weighed 30 lbs. 3 ozs. ; alone it weighed 25 lbs. 12 ozs. On longitudinal section through the fore and hind-quarters on each side the difference in size, colour and density was very marked.

Uninoculated Quarters.—Right fore and left hind, Showed no tuberculous disease visible to the naked eye. The quarters were small, soft, fibroid, and of a creamy white colour ; the milk sinuses and ducts contained a thick viscid milky white fluid.

Inoculated Quarters :—

Right Hind.—Antero-posterior measurement 30 cm.; vertical, 23 cm.

The tissue throughout the quarter was dense, firm, deeply congested and slightly œdematous, and showed particularly in the inferior and posterior parts of the quarter numerous areas of caseation. In the central and anterior parts of the quarter the caseous areas were small and scattered, whereas in the inferior and posterior parts they were fairly large, and at many points confluent. Each caseous mass was surrounded by a zone of congestion, and several showed foci of congestion in the midst of the caseous tissue. There was no calcareous change.

The milk sinuses and ducts were widely dilated, and contained a small amount of turbid serous fluid ; on the mucous membrane there was a closely set outgrowth of caseous granulations ; the caseous tissue could be readily scraped away from the granulations, leaving slightly elevated congested papillæ : a few granulations were also seen on the mucous membrane of the teat itself.

Left Fore.—Antero-posterior and vertical measurements : 25 cm. This quarter closely resembled the right hind, but caseation was somewhat less in amount and extent ; as in the right hind the peripheral parts and the parts around the milk sinuses were more extensively tuberculous than the centre and base. The granulations in the milk sinuses and ducts were not so abundant as in the right hind.

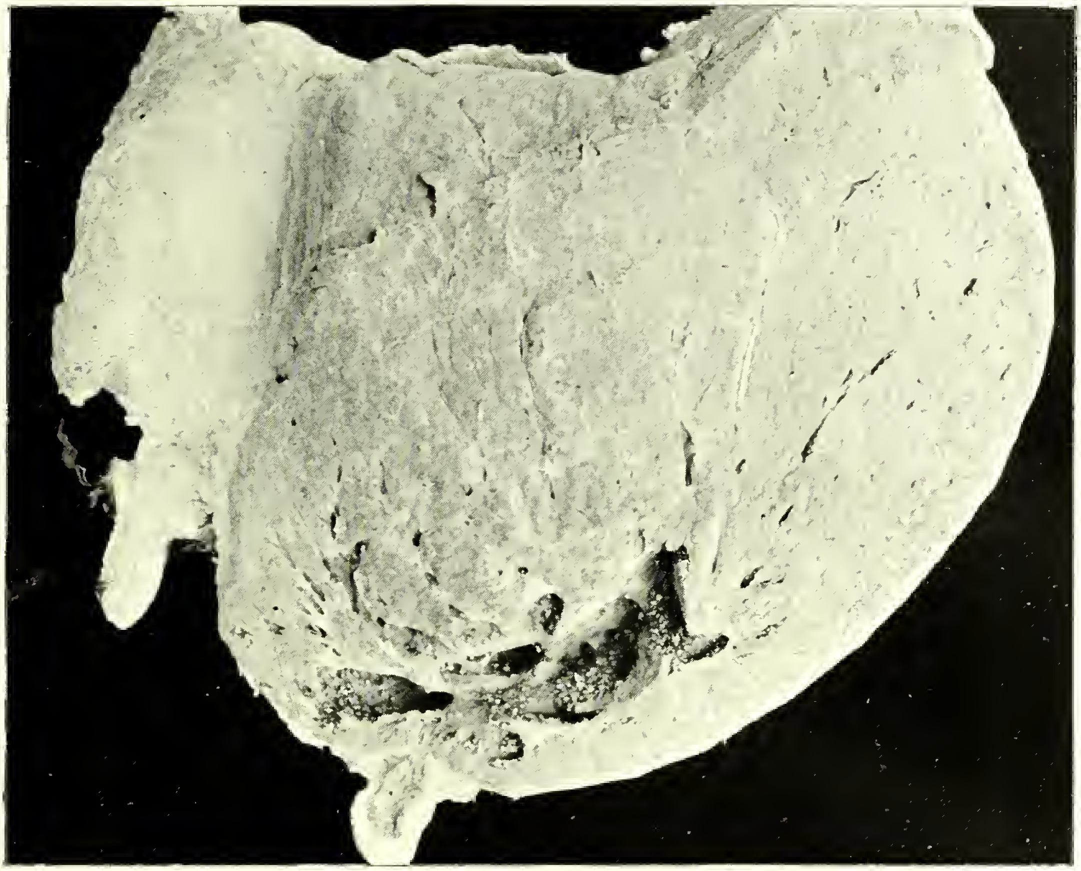
There was an increase in both quarters of interstitial connective tissue.

Neighbouring Lymphatic Glands.—On the posterior and superior aspect of the udder there was one large gland (formed by the natural fusion of the right and left supramammary lymphatic glands) weighing 2 lbs., and measuring 17 by 13 by 5 cm. The tissues around the gland were very œdematous. On section the cortex of the gland was tuberculous throughout, that part nearest the udder being more affected than that furthest away. The tuberculous tissue was far advanced in caseation, but was not softened or calcareous ; here and there patches of deep congestion were seen ; the capsule was slightly thickened.

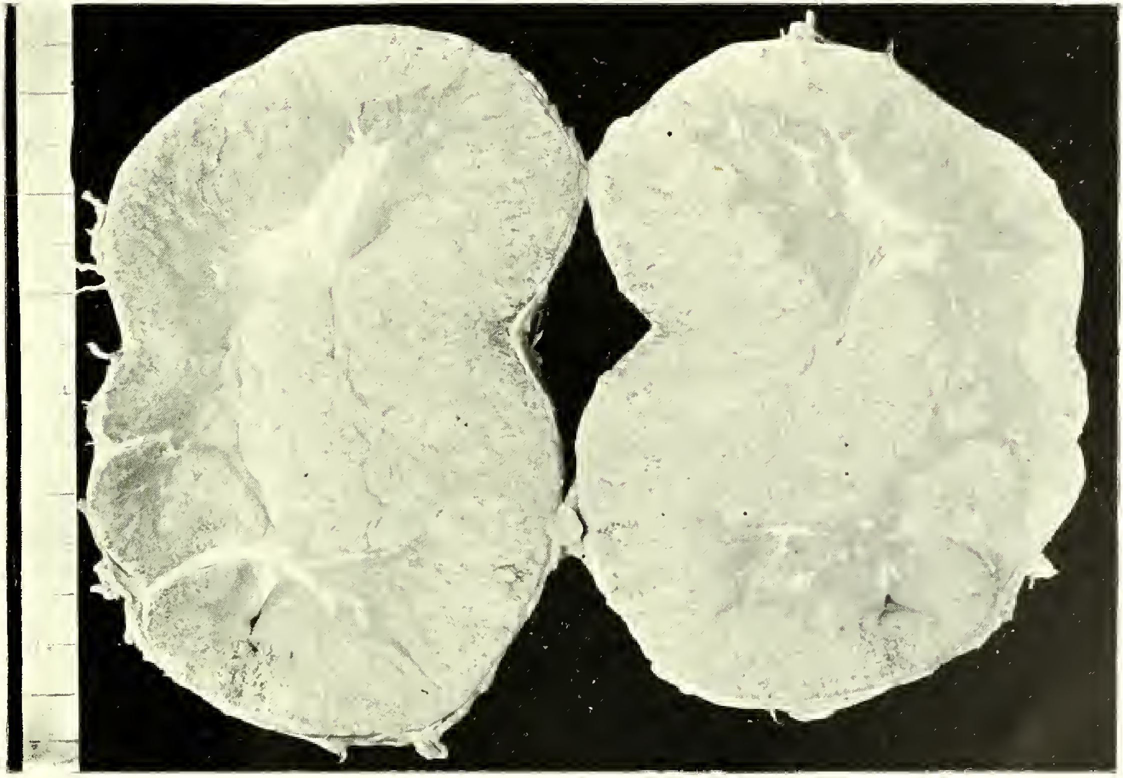
A small gland, the size of a broad bean, above the left part of the gland, showed scattered throughout the substance minute greyish yellow foci.

Right Iliac Glands (three in number).—Not obviously enlarged on section very congested and slightly œdematous, showed no naked eye tubercle.

Left Iliac Glands (three in number).—The posterior one of the series was greatly enlarged, weighing half a pound. Beneath the capsule a network of distended lymphatic channels was seen. On section the substance was slightly congested, very soft, and œdematous, and



COW 44. Intramammary. Virus B. I.
Udder: longitudinal section of right fore and right hind quarters.



COW 44. Intramammary. Virus B. I.
One of the supramammary lymphatic glands, cut open.

showed isolated caseous foci, and firm grey nodules, irregular in outline, grouped chiefly in the part of the gland nearest the hilum.

The two glands anterior to this, and the gland at the bifurcation of the aorta, were deeply congested and slightly œdematous.

The lumbar glands were in a similar condition.

The fat around the kidneys and the mesentery was moderate in amount and of a deep yellow colour.

Omentum and Peritoneum.—Showed no tubercle.

Spleen.—1 lb. 10 ozs. Normal on the surface; on section showed no sign of tubercle.

Liver.—13 lbs. 9 ozs. Showed no tubercle either on the surface or on section. In the left lobe there were about half a dozen yellow masses, irregular in outline, consisting of altered liver tissue, probably of the nature of infarctions.

Hepatic Lymphatic Glands.—Normal.

Right Kidney.—1 lb. 4 ozs. Normal on surface and on section.

Left Kidney.—1 lb. 6 ozs. Normal on surface and on section.

Suprarenal Bodies.—Normal.

Lungs.—Colour brick-red, crepitant throughout. Wide spread interstitial emphysema, particularly well marked in the anterior lobes; no sign of tubercle.

Thoracic Lymphatic Glands.—Normal.

Tongue, Pharynx, Tonsils.—Normal.

Submaxilliary, Parotid, and Post-Pharyngeal Glands.—Normal.

Intestines (large and small).—Normal throughout.

Gastric, Mesenteric, and Colic Glands.—Normal.

Diaphragm (both Surfaces) and Heart.—Normal.

Cervical, Prescapular, Prepectoral, and Axillary Glands.—Normal.

Precrural, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Uterus, Ovaries, and Fallopian Tubes.—Normal.

Microscopical Examination.

Smears from a milk sinus granulation, the supramammary and left iliac lymphatic glands, showed numerous tubercle bacilli.

No tubercle bacilli were seen in smears from the right iliac and lumbar glands.

Animals Inoculated.

Cow 64. Injected in the udder with 9·3 c.c. (into each of two quarters) of the mixed milk from the two inoculated quarters; the milk, or serous fluid, was withdrawn a short time before death, and was found to contain 53,933 tubercle bacilli per c.c.

G.P. 754 and G.P. 755 inoculated subcutaneously and G.P. 756 and G.P. 757 inoculated intraperitonally each with 1·0 c.c. of the same milk, developed tuberculosis.

G.P. 758. inoculated subcutaneously with emulsion made from the spleen, died of tuberculosis in 25 days.

GUINEA-PIGS INOCULATED WITH MILK OF COW 44.

DOSES:—In the 1st, 2nd and 4th series the two guinea-pigs from each quarter received the centrifugalised deposit of 30 cc. of milk.

Date of Inoculation.	No. of Guinea-Pig and quarter of Udder.		Weight in grammes.	Killed or Died.	Length of Life in days.			Result.
					Intrap.	Subcut.	Feeding.	
November 4th, 1903 - (The milk used for this series was withdrawn from the cow before her inoculation.)	*675	R. F. -	300	K.	—	62	—	G. T.
	*676		360	K.	62	—	—	H.
	*677	L. H. -	280	K.	—	62	—	H.
	*678		350	K.	62	—	—	H.
	*679	L. F. -	300	K.	—	62	—	T.
	*680		230	K.	62	—	—	H.
	*681	R.H. -	260	K.	—	62	—	H.
	*682		320	K.	62	—	—	H.
November 23rd, 1903 - (19 days after the inoculation of the cow.	*715	R. F. -	210	K.	—	43	—	S. T.
	*716		170	K.	43	—	—	S. T.
	*717	L. H. -	230	K.	—	43	—	S. T.
	*718		160	K.	43	—	—	S. T.
	*719	L. F. -	180	D.	—	68	—	G. T.
	720		150	D.	81	—	—	T.
	721	R. H. -	220	D.	—	35	—	T.
	722		180	D.	20	—	—	T.
November 26th, 1903 - (Fed 11 days.).	727	- -	—	D.	—	—	11	No T.
	728	- -	—	D.	—	—	11	No T.
	*729	- -	—	K.	—	—	40	S. T.
	*730	- -	—	K.	—	—	40	S. T
December 9th, 1903 -	*732	R. F.	220	K.	—	28	—	S. T.
	*733		220	K.	28	—	—	H.
	*734	L. H. -	160	K.	—	28	—	S. T.
	*735		200	K.	28	—	—	S. T.
	736	L. F. -	190	D.	—	23	—	T.
	737		200	D.	19	—	—	G. T.
	738	R. H. -	210	D.	—	17	—	S. T.
	739		220	D.	24	—	—	T.
December 10th, 1903 - (Fed 6 days.)	*740	- -	—	K.	—	—	26	S. T.
	*741	- -	—	K.	—	—	26	S. T.
	*742	- -	—	K.	—	—	26	S. T.
	*743	- -	—	K.	—	—	26	S. T.
December 15th, 1903 -	754	L. F.	160	D.	—	24	—	T.
	755	R. H.	140	D.	—	17	—	S. T.
	756	Dose,	130	D.	13	—	—	T.
	757	1·0 c.c.	140	D.	19	—	—	G. T.

* The Guinea-pigs marked thus [*] were killed by a dog.

NOTE.—G.P. 675.—No local lesion. Great enlargement and caseation of thoracic, mesenteric and hepatic lymphatic glands; neck glands slightly affected. Tubercles in liver, spleen, lungs, and kidneys.

G.P. 679.—No local lesion; slight tuberculosis of the submaxillary lymphatic glands, liver, spleen, and lungs; great enlargement and caseation of the mediastinal glands.

The distribution of the lesions in these two Guinea-pigs suggested spontaneous tuberculosis.

EXPLANATION OF ABBREVIATIONS.

H. = Healthy.
No T. = No tuberculosis.
S.T. = Slight tuberculosis.
T. = Tuberculosis not so extensive as G.T.
G.T. = General tuberculosis.

ORANG 4.

Feeding Experiment—Fed with the milk of Cow 44 for twelve days.

Date of Commencement—November 22nd, 1903.

Died—Of gastro-enteritis on December 9th, 1903. 16 days after the feeding began.

Note.—Only two orangs were used for experimental purposes. It was found that they did not eat well or thrive in captivity, and this in addition to the great difficulty in obtaining these animals in sufficient numbers decided the Commission to confine their experiments on anthropoid apes to chimpanzees. (For Orang 8 see page 643).

ABSTRACT OF POST-MORTEM NOTES.

The body was slightly emaciated. The intestines and mesenteric glands showed no macrosopic evidence of tuberculosis. The liver, spleen and kidneys were healthy. There was congestion at the base of one lung; with this exception the lungs appeared normal.

For full notes see page 642.

COW 64.

Intramammary—9·3 cc. of the milk of Cow 44 into each of two quarters.

Number of Bacilli Inoculated—500,000 into each quarter.

Date—December 15th, 1903.

Died—January 22nd, 1904, in the evening. 48 days after inoculation.

Clinical History.

The cow was inoculated on December 15th, 1903, a measured quantity of the milk of Cow 44 being injected into the right-hind and left-fore quarters of the udder.

On the day after inoculation the infected quarters were slightly enlarged and tender, but the inflammation had completely subsided on the following day. Ten days after the commencement of the experiment the infected quarters were first felt to be indurated, and by the end of December they were distinctly hard and the animal was becoming ill. At the end of the third week the cow was in very poor condition. She was emaciated and her respiration was to some extent laboured. A week later the general condition was much the same. There was a discharge of mucus from the nose, and diarrhœa. The infected quarters of the udder were uniformly indurated, but not very large; the non-inoculated quarters were smaller than normal.

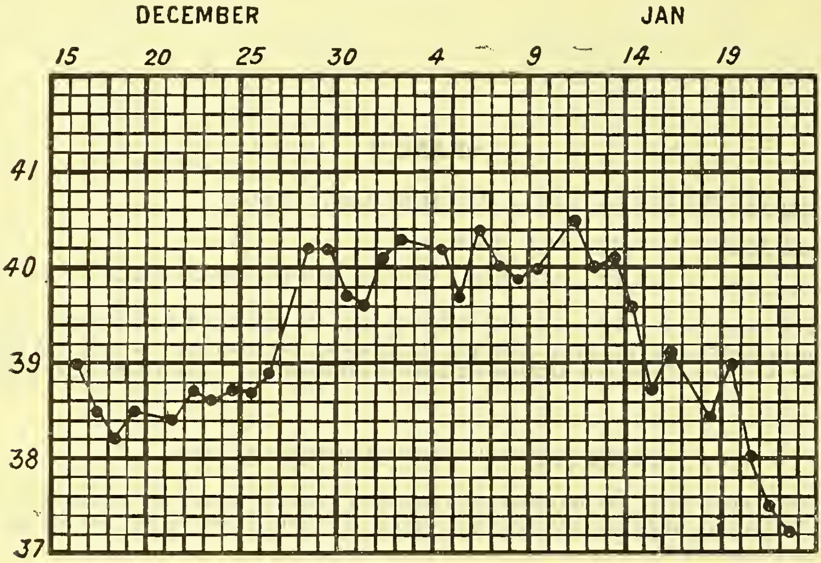
The animal steadily became more ill, and died 48 days after the inoculation.

Weights.

	cwt.	qr.	lbs.
December 12th, 1903 - - -	7	0	2
January 22nd, 1904 - - -	4	1	18

Total loss of weight.—2 cwt. 2 qrs. 12 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Considerably emaciated.

There was an absence of œdema fluid in the subcutaneous tissues in front of the udder, and only a slight amount between the skin and the inoculated quarters; there was, however, well marked œdema around the supramammary lymphatic glands.

Udder.—With skin and glands attached, weighed 21 lbs.; alone it weighed 17 lbs.

Inoculated Quarters:

Left-Fore.—Antero-posterior measurement, 18 cm.; vertical, 14 cm.

The quarter was uniformly hard, and on longitudinal section was seen to be caseating throughout, no trace of normal gland remaining. The caseous areas were confluent, and not appreciably calcareous; the capsule of the quarter appeared to be thickened; the interstitial connective tissue was œdematous and slightly congested. The milk sinuses and ducts were dilated, and contained turbid yellow serum and a few irregular coagula.

The mucous membrane was thickened, and was covered with a thick crop of firm caseous granulations; the membrane of the teat showed scattered translucent granules.

Right-Hind.—Antero-posterior measurement, 21 cm.; vertical, 22 cm.

On section this quarter resembled in every respect the left-fore.

The milk sinuses contained in addition to turbid serum, adherent yellow fibrinous material, which formed an almost complete cast of the interior. The mucous membrane showed the same development of granulations as in the left-fore.

Uninoculated Quarters:

Right-Fore.—The quarter was small and pale, and showed an increased amount of interstitial connective tissue, but no tubercles.

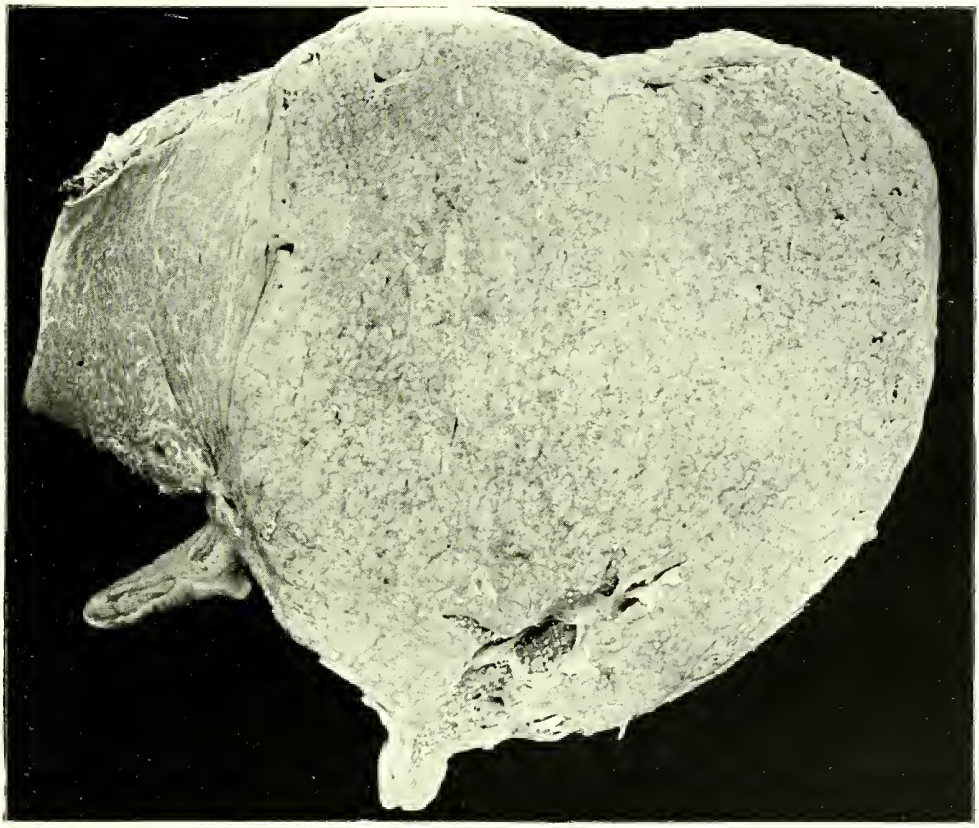
Left-Fore.—On longitudinal section was apparently unaffected. The external part of the quarter, near the base, however, felt indurated, and on radial section showed some suspicious yellow points (a smear from this part of the gland showed fairly numerous tubercle bacilli).

The milk sinuses and ducts of both non-inoculated quarters contained a thick yellowish-white fluid; the mucous membrane was normal in appearance.

Neighbouring Lymphatic Glands.—The right supramammary lymphatic gland was greatly enlarged, weighing 1 lb. 2 ozs., and measuring 7 in. by 4 in. by 2 in. The gland was kidney-shaped, and on section was seen to consist throughout of firm greyish white caseous masses; the tuberculous tissue was œdematous and slightly congested.

Between the anterior end of this gland and the udder there was a second gland, the size of a chestnut, also tuberculous throughout.

On the left side there were two similar glands; the large one, of the same size and shape as the one on the opposite side, was caseous throughout, with the exception of a small patch at one extremity, which showed miliary foci.



COW 64. Intramammary Inoculation. Virus B.

Udder: longitudinal section through the right fore (un-inoculated), and right hind (inoculated) quarters.

The small gland at the anterior end of the large one was caseous, but not so completely as the corresponding one on the right side.

Iliac Glands.—On the left side the posterior one of the series was greatly enlarged (weighing 8 ozs.), soft and œdematous; the lymphatics in the capsule were distended with clear fluid; on section the tissue was congested, and filled with greyish yellow miliary tubercles. Two glands anterior to this, and a sacro-iliac gland, were slightly enlarged and œdematous, and contained similar foci.

On the right side the glands (two) were unaffected.

Lumbar Glands.—The chain of glands in the lumbar region appeared normal.

The Left Precrural Gland was about four times the size of the right; on section there was a mass of caseating tissue, similar to that in the supramammary glands, affecting about half the substance; in other parts of the gland there were scattered minute yellow foci.

Right Popliteal Gland—Very juicy on section; showed in the cortex a caseous focus, the size of a pin-head.

Right Precrural and Left Popliteal.—Normal.

Abdomen:

Omentum.—Contained very little fat, and was free from tubercle.

Peritoneum (Visceral and Parietal).—Normal.

Spleen.—Weighed 1 lb. Normal on the surface; no tubercle seen on section.

Liver.—Weighed 14 lbs. 6 ozs. Showed on both surfaces, under the capsule, a number of greyish white foci, just visible to the naked eye; similar foci, sparsely scattered, were seen in the depth of the liver substance. (Smears were made from five of these foci, but no tubercle bacilli were found.)

Gall Bladder.—Normal.

Hepatic Lymphatic Glands.—Normal.

Right Kidney.—Normal on the surface and on section.

Left Kidney.—Normal on the surface and on section.

Suprarenal Bodies.—Normal.

Intestines.—Normal throughout

Gastric, Mesenteric and Colic Glands.—Normal.

Uterus.—Contained a foetus, about 30 cm. long. The internal surface of the uterus and the ovaries were normal. The foetal organs and glands had a normal appearance, with the exception of the spleen, which showed a suspicious greyish point on the surface. (Part of the spleen, including this focus, was emulsified and inoculated into a guinea-pig; no tubercle bacilli were found in the smear made from the emulsion.)

Bladder.—Normal.

Thorax:

Costal Pleura, and pleural surface of Diaphragm.—Normal.

Heart and Pericardium.—Normal.

Lungs.—The lungs showed widespread interstitial emphysema, and several patches of collapse (no parasites in the bronchi leading to the patches). On the surface, but mainly on that of the caudal lobes, there were seen moderately numerous foci: many of these foci were very minute, and were just visible to the naked eye as dark specks; others attained the dimensions of a large shot, and were caseous; in the parenchyma of the lung a few small yellow tubercles were seen.

Near the dorsal surface of the right caudal lobe, in the substance, there was a firm nodule measuring 2½ in. in diameter, which on section showed consolidated (but not completely airless) lung tissue, intersected by greatly thickened alveolar walls; there was no sign of caseation.

Thoracic Glands.—All the dorsal mediastinal and bronchial lymphatic glands were deeply congested.

The long caudal gland showed no sign of tubercle The two glands anterior to this contained a few yellow foci.

A gland in the anterior part of the dorsal mediastinum contained similar foci.

The bronchial glands appeared slightly enlarged; they showed on section scattered yellow foci.

The ventral mediastinal glands contained one or two similar foci.

Tongue, Pharynx, Larynx and Trachea.—Normal.

Tonsils, Post-Pharyngeal, Parotid and Submaxillary Lymphatic Glands.—Normal.

Cervical, Prescapular, Prepectoral and Axillary Glands on both sides.—Normal.

Gluteal and Ischiatic Glands.—Normal.

Thymus and Thyroid.—Normal.

Microscopical Examination.

Smears from—

Supramammary Gland (emulsion).—Tubercle bacilli numerous.

Left Precrural Gland.—Tubercle bacilli numerous.

Lung Tubercle (1).—Tubercle bacilli numerous.

Lung Tubercle (2).—Tubercle bacilli scanty.

Left Hind Quarter.—Tubercle bacilli fairly numerous.

Right Popliteal Gland.—Tubercle bacilli fairly numerous.

Liver (5 smears).—No tubercle bacilli.

Lung (Pneumonic Nodule).—No tubercle bacilli.

Mediastinal Gland.—Tubercle bacilli.

Fœtal Spleen (emulsion).—No tubercle bacilli.

Guinea-pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from the supramammary lymphatic glands, one subcutaneously, the other intraperitoneally, died of tuberculosis in 17 and 28 days respectively.

A guinea-pig inoculated subcutaneously with an emulsion made from the spleen died of general tuberculosis in 55 days.

Another inoculated with an emulsion made from the spleen of the foetus died of general tuberculosis in 102 days.

For guinea-pigs inoculated with milk see page 86.

GUINEA-PIGS INOCULATED WITH MILK OF COW 64.

Date of Inoculation.	Guinea-pig, No. of and Quarter of Udder.	Weight in Grammes.	Amount of milk Inoculated. (Not centrifugalised).	Killed or Died.	Length of Life in Days.			RESULT.
					Intrap.	Subcut.	Feeding.	
January, 6, 1904.	773 RF.	170	4 c.c.	Killed		47		No T.
	774	220	4 c.c.	Killed	47			T.
	775 LH.	250	4 c.c.	Killed		47		H.
	776	200	4 c.c.	Killed	47			H.
	777 LF.	260	4 c.c.	Died		37		G.T.
	778	180	4 c.c.	Died	5			Intestinal obstruction.
	779 RH.	160	4 c.c.	Died		37		G.T.
	780	250	4 c.c.	Died	15			T.
January 12, 1904.	790 LF. & RH.	190	3·4 c.c. into each.	Died		32		G.T.
	791	160	=54,000 T.B.	Died	14			T.P.
January 15, 1904.	800 LF. & RH.	140	0·3 c.c. into each.	Died		31		G.T.
	801	160		Died		40		G.T.
	802	140	=(approx.) 50,000 T.B.	Died	33			G.T.
	803	150		Died	21			T.
January 19, 1904.	808 LF. & RH.	160	0·076 c.c.	Died		40		G.T.
	809	150	=(approx.) 50,000 T.B.	Died	17			T.
January 21, 1904.	814 LF. & RH.	150	Fed once, each receiving about 250,000 T.B.	Killed			114	Healthy.
	815	150		Died			18	S.T.
January 22, 1904.	818 LF. & RH.	200	0·09 c.c.	Died		37		G.T.
	819	140	=50,000 T.B.	Died	22			G.T.
January 23, 1904.	822 RF.	150	About 4·0 c.c.	Died		25		G.T.
	823 LH.	160	About 4·0 c.c. withdrawn after death.	Died		55		G.T.

Average duration of life of 6 G.P.s inoculated intraperitoneally with tuberculous milk = 20·3 days.
" " " 9 G.P.s " subcutaneously " " " = 37·1 "

For explanation of abbreviations *see* Cow 44, page 82.

HEIFER 8.

Intravenous Inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs which had been inoculated with the original material of Virus B. I.

Dose—10 cc. [Number of bacilli not estimated.]

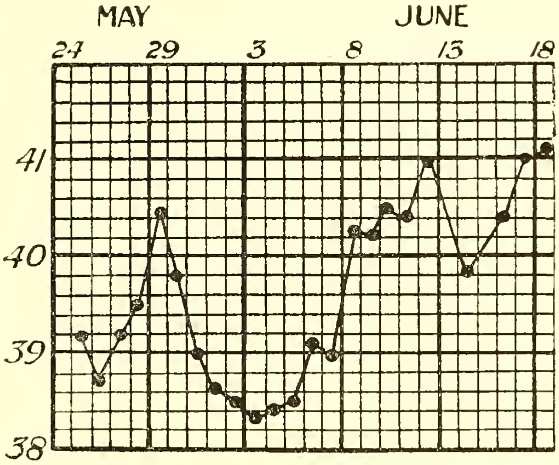
Date—May 24th, 1902.

Killed—June 18th, 1902. 25 days after inoculation.

Clinical History.

The heifer was inoculated intravenously on May 24th, 1902. The animal remained apparently well for ten days or a fortnight and then high fever suddenly set in. On the nineteenth day the respirations were observed to be hurried (56 per minute). On the twenty-third day 76 was recorded; on the twenty-fifth day it had reached 90 per minute, and the animal being very distressed for want of breath was killed.

Temperature.



POST-MORTEM EXAMINATION.

Body fairly well nourished.

Seat of Inoculation.—Over the left jugular vein there was a nodule about twice the size of a garden bean. On section this was found to be caseating, but not softened. No tubercles on intima of vein.

Prescapular Lymphatic Gland.—On left side contained some tubercles in the cortex.

Lungs.—The lung tissue was everywhere closely beset with tubercles about the size of mustard seeds. In each lung considerable areas, while crammed with such tubercles, were hepatised.

Bronchial and Mediastinal Glands.—Enlarged to three times their normal size. The cortex was crammed with tubercles which were caseating, but not softening.

Spleen, Liver, Kidneys.—No tubercles visible to the naked eye.

Throat, Tongue and Pharyngeal Glands.—Normal.

Stomach and Intestines.—Exterior normal in appearance; interior not examined.

Uterus, Ovaries and Bladder.—Healthy.

Heart.—Normal.

Pericardium, Pleura, Peritoneum.—Normal.

Other Lymphatic Glands.—Normal.

Microscopical Examination.

Lung.—Tubercle bacilli.

Kidney.—No tubercle bacilli.

HEIFER 24.

Intravenous Inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs which had been inoculated with the original material of Virus B. I.

Dose—10 cc. [Number of bacilli not estimated.]

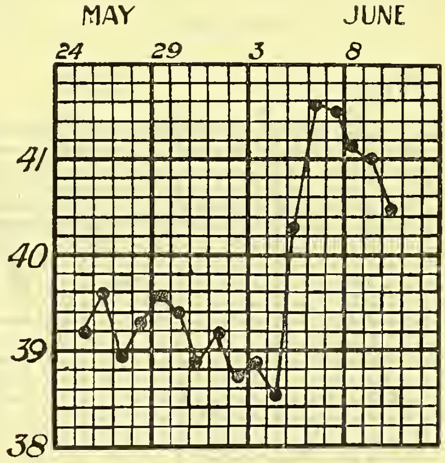
Date—May 24th, 1902.

Died—June 10th, 1902. 18 days after inoculation.

Clinical History.

The heifer was inoculated intravenously on May 24th, 1902. The animal remained apparently well during the first fortnight, and then high fever with rigors suddenly set in. The respiration became greatly accelerated, 88 per minute being recorded on the sixteenth day. On the seventeenth day she was gravely ill and on the eighteenth day after inoculation was found dead.

Temperature.



POST-MORTEM EXAMINATION.

Seat of Injection.—A tumour of the size of one's fist surrounded the jugular vein, which was patent but somewhat constricted; there was no thrombosis; small tubercles were seen on the intima of the vein close to the seat of injection. In the tumour was a small abscess cavity containing thick pus.

Thorax:

Lungs.—Showed extreme emphysema and were honeycombed with cavities large and small; some were large and obviously between the lobules, therefore interstitial.

Frothy blood-stained mucus and long strings of purple blood clot were found in the bronchi, the latter blocking many of the smaller tubes.

Miliary Tubercles were thickly scattered all over lung, equally numerous in the air containing and airless parts.

Portions of the consolidated lung sank in water (? collapse or consolidation).

The Bronchial and Mediastinal Glands were enlarged and contained numerous small tubercles.

Pericardium and Heart.—Normal.

Pleura.—Normal.

Abdomen:

Peritoneum.—Normal.

Stomach and Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—Normal.

Liver.—A portion of the liver was speckled with little pale yellowish foci.

Kidneys and *Suprarenal Bodies.*—Normal.

Pancreas and Lumbar Glands.—Normal.

Tongue, Œsophagus, Lingual and Œsophageal Glands.—Normal.

Microscopical Examination.

Bronchial Gland *Lung*	Numerous tubercle bacilli.
Spleen *Liver* *Kidney*	No tubercle bacilli.

COW 18.

Intramammary Inoculation of an emulsion made from the tuberculous organs of eight guinea-pigs inoculated with the original material of Virus B. I

Date—May 24th, 1902.

Dose—Not estimated.

Killed—June 28th, 1902. 35 days after inoculation.

Clinical History.

Ten c.c. of the emulsion were injected into the right hind and the same quantity into the left fore-quarters of the udder on May 24th.

The cow had given birth to a calf some time previously. This calf died and another, Calf 20, born of a cow that had died of milk-fever, was being suckled by Cow 18 at the time of experiment. The calf was separated from its foster-mother for twenty-four hours after the intramammary injection and then allowed again to suckle.

Enlargement and induration of the infected quarters were noted within a few days after inoculation. By the 10th of June they were both much enlarged and hard. The non-infected quarters remained normal. The precrural glands were enlarged. A week later œdema was noticed in the abdominal wall in front of the udder, and the animal was obviously ill. She rapidly became worse, and for the last three days of life was unable to stand On June 28, 35 days after the inoculation, she was apparently dying, and was therefore killed.

Temperature.

The temperature remained normal during the first six days after inoculation. On May 31st it rose to 40·5°, falling to normal on the next day. From June 5th to the 19th there was a gradual and steady rise to 41·8°, and then a slight fall. During the last week of life the temperature varied between 39·5° and 40°.

POST-MORTEM EXAMINATION.

Mammary Gland. weighed 11 lbs. 6 oz. There was marked œdema around mammary gland, and also in the mammary tissue itself.

Non-Injected Quarters, R.F. and L.H., pale, not congested; no tuberculous foci; no sign of milk, milk sinuses being filled with turbid fluid.

Injected Quarters (R. H. and L. F.).—Much enlarged; indurated; congested, especially in the lower portion. Caseation advanced; this was most marked in lower portion. Milk sinuses lined with mucous membrane, swollen, reddened and covered with numerous granulations showing signs of caseation in their centres.

Supramammary Glands both together weighed 2 lbs. Left greatly enlarged (6 in. by 3 in.), indurated, congested, and showed general caseous necrosis.

Right supramammary gland resembled the left, but was not so large.

(The condition of the mammary gland and its lymphatic glands closely resembled those of Cows 4 and 500, though they were perhaps in a slightly less advanced condition.)

Kidneys.—Normal.

Spleen.—On section presented a few minute scattered foci—(tubercle bacilli were subsequently found in cover slip preparations prepared from them.)

Liver.—On section presented a very few minute scattered foci, from which cover slip preparations were made, but in which no tubercle bacilli were found.

Pancreas.—Appeared to be normal.

Suprarenals.—Both appeared to be affected in the medulla by some commencing caseous change.

Mesenteric Lymphatic Glands.—Appeared to be normal.

Stomach and Intestines.—Appeared normal on inspection, but were not opened.

Uterus, Bladder, Vagina, Ovaries.—Normal.

Lungs.—Both showed a few collapsed congested areas, and these were usually associated with what appeared to be minute yellow tubercles. There were also a few other tubercles in otherwise normal portions of lung. A cover slip preparation from one of them showed tubercle bacilli.

Abdominal and Pelvic Glands, External Iliac, Inguinal and Lumbar Glands (including those at bifurcation of aorta) were enlarged and tuberculous.

CALF 20.

Age—6 weeks.

Sucking from Cow 18—From May 25th, 1902, to June 28th, 1902, a period of 34 days.

Killed—January 28th, 1903. 229 days after the experiment began.

ABSTRACT OF THE POST-MORTEM NOTES.

The post-mortem examination showed four or five of the Peyer's patches, two or three feet above the ileo-cœcal valve, thickened with little yellowish white nodular deposits beneath the mucous membrane. The latter was quite intact over them, but a slight puckering suggested the previous existence of some ulceration. On the serous surface of these patches were groups of rather prominent yellow tubercles as large as mustard-seeds. In the upper part of the duodenum also were a few hard yellowish spots beneath the mucous membrane. All the mesenteric glands contained yellow calcareous and softened patches, and some were almost entirely calcareous and caseous. In the liver, one spherical hard tubercle as large as a mustard-seed was seen.

On the surface of the right cephalic lobe of the lung were little pedunculated or sessile masses, and on the contiguous part of the costal pleura was a flattened raised growth of yellowish tissue. There were no lesions anywhere else.

Guinea-pigs inoculated from the bronchial gland and spleen did not develop tuberculosis.

Note.—The full notes on this animal are given on page 675.

GUINEA-PIGS INOCULATED WITH MILK OF COW 18.

Doses: 30 cc. of milk from each quarter were centrifugalised and the deposit inoculated into two guinea-pigs, one subcutaneously, the other intraperitoneally.

Date of Inoculation.	No. of Guinea-Pig and quarter of Udder.	Weight in grammes.	Length of Life in days.		Killed or Died.	Result.
			Intrap.	Subcut.		
May 24, 1903 (Inoculated with milk withdrawn before the cow was inoculated).	49 R.F.	320		130	K.	H.
	50	510	8		D.	No T.
	51 L.F.	330		88	D.	No T
	52	310	156		D.	No T.
	53 R.H.	730		88	D.	No T.
	55 L.H.	220		157	K.	H.
	56	280	148		K.	No T.
June 3, 1902. (10 days after inoculation).	81 R.F.	480		196	K.	H.
	82	350	146		K.	H
	83 L.H.	280		59	D.	No T.
	84	350	146		K.	H.
	85 L.F.	300		134	D.	T.
	86	270	61		D.	G.T.
	87 R.H.	560		66	D.	G.T.
	88	350	44		D.	G.T.
June 20, 1902. (27 days after inoculation).	105 R.F.	300		132	K.	G.T.
	106	350	97		D.	G.T.
	107 L.H.	460		133	K.	T.
	108	310	88		D.	G.T.
	109 L.F.	330		59	D.	G.T.
	110	300	49		D.	G.T
	111 R.H.	270		79	D.	G.T.
	112	320	35		D.	T.

NOTE: For explanation of abbreviations *see* Page 82.

CALF 132.

Subcutaneous Inoculation of an emulsion made from the tuberculous organs of Monkey 62, fed with milk of Cow 72.

Dose—932,800 tubercle bacilli in 22 cc. of the emulsion.

Date—September 8th, 1903.

Weight—2 qrs. 13 lbs.

Age—13 weeks.

Died—October 13th. 34½ days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck.

Nine days after inoculation there was a tumour the size of a pigeon's egg; this rapidly grew larger, and on September 25th, 17 days after inoculation, there was a prominent firm tumour, measuring 4 in. by 3¾ in. from the lower extremity of which a tender œdematous band, about 6 in. in length, extended backwards along the side of the trachea. The tumour on the side of the neck increased in size and the œdematous band became thicker and denser. The prescapular gland attained a length of over 4 in.

The general health of the animal during the first seventeen days was unaltered; then the calf began rapidly to lose ground; the respirations gradually increased in frequency, and the animal became thinner and weaker.

On October 8th the calf had a rigor, and subsequently became more acutely ill. On the 11th its appetite failed, and it was almost too weak to rise from the ground; the respirations were increased (48), expiration ending in a short grunt; the accessory muscles of respiration were brought into action and the head was held extended to its fullest extent; there was frequent cough.

These symptoms continued and increased in severity, the calf becoming very weak and emaciated. It was found dead on the morning of October 13th, 1903.

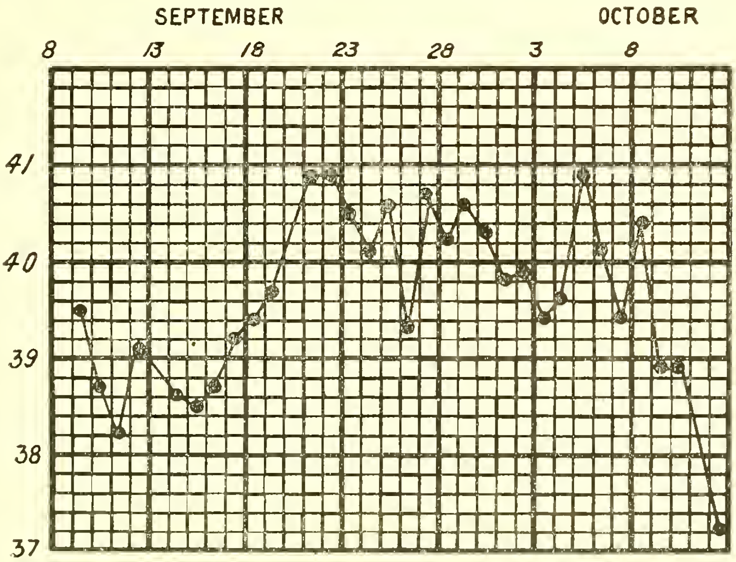
Weights.

During the first week there was a gain in weight of 5 lbs.; then for a week the weight was stationary; subsequently there was a steady loss in weight.

	qrs.	lbs.
September 8th, 1903 - - -	2	13
September 15th, 1903 - - -	2	18
September 22nd, 1903 - - -	2	18
September 29th, 1903 - - -	2	14
October 6th, 1903 - - - -	2	11
October 12th, 1903 - - - -	2	7

Loss in Weight.—6 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass greatly emaciated.

Local Lesion.—Extending from the seat of inoculation (in front of the left shoulder) to the episternum, and curving round the left shoulder and prescapular gland, there was an elongated firm tumour. The total length of the tumour was about ten inches; the upper part was 4 in. broad and a little over one inch thick; the middle 2 in. by ⅝ in.; it tapered gradually as it neared the sternum. The skin covering the tumour was everywhere intimately adherent, but not ulcerated. The muscle beneath the upper part of the tumour was infiltrated and incorporated. The tissues around the tumour and the neighbouring glands were very œdematous. On section through the upper part of the tumour it was seen to be mainly composed of dense greyish yellow tissue; in the centre of the tumour there was a small cavity containing caseo-pus; the peripheral parts were pinkish red and œdematous, and were crowded with minute greyish yellow tubercles. That part of the tumour which was prolonged into the dewlap showed on section bright red gelatinous tissue, closely beset with little greyish yellow tubercles. The loose tissues on each side of the episternum were œdematous and infiltrated with numbers of small grey tubercles; similar tubercles were seen in the pectoral muscles near their insertions.

Left Prescapular Gland.—Weighed 3½ ozs. and measured 3¼ in. by 1¾ in. by 1¼ in. On section it was seen to consist throughout of dense firm greyish yellow caseated tissue;

entering the hilum of the gland there was a thickened lymphatic vessel, wholly caseous, and lying near the upper end there were a few groups of small yellow tubercles.

Left Prepectoral Glands.—One left prepectoral gland, ½ in. in diameter, was uniformly caseous: a second, 1 in. long and ¼ in. broad, showed caseous masses affecting about half the substance.

Two hæmo-lymph glands beneath the left prescapular gland contained caseous nodules.

Right Prescapular Gland.—Weighed about ½ oz. and measured 2 in. by 1 in. On section the tissue was very congested and œdematous; one half of the cortex was occupied by dense caseous substance; the other half seemed normal.

Right Prepectoral Glands.—One right prepectoral gland the size of a small bean, had about a quarter of the cortex caseous: a second very small gland contained a caseous focus. Two other small glands normal.

Right Axillary Glands.—Normal.

Cervical Glands.—A gland in the middle of the neck, along the left side of the trachea, ¾ in. long. had about half its substance caseous. The gland on the opposite side, the size of a wheat grain, contained a minute tubercle.

Two glands higher up on each side of the larynx showed several tubercles.

Abdomen.

Omentum and Peritoneum.—There was a complete absence of fat in the omentum; the vessels were slightly engorged: dotted here and there were some minute yellowish specks and small caseous tubercles (not more than ten).

The peritoneum on the floor of the abdomen showed a few yellow points.

There was a slight amount of blood-stained fluid in the abdominal cavity.

Spleen.—Weighed 5 ozs. The vessels in the capsule were engorged; the parenchyma was dark and soft, and contained numerous rounded grey tubercles (the size of a No. 4 shot), not apparently caseous.

Liver.—Weighed 2 lbs. 13 ozs. The substance was pale and friable, and was crowded with numerous grey tubercles, ranging in size from a mustard seed downwards. A few of the larger tubercles showed in the centre a minute yellow point.

Beneath the mucous membrane of the gall bladder there were six pin-head sized greyish tubercles.

Hepatic Lymph Glands.—Were enlarged, and presented many little grey tubercles.

Left Kidney.—Weighed 5 ozs.; the capsule stripped readily, showing a mottled surface; in each lobulation two or three grey tubercles, the size of mustard seeds, were seen; a few similar tubercles were seen on section. The tissue was pale, and the vessels were congested in every part.

Right Kidney.—Weighed 7 ozs. and resembled in every respect the left.

Suprarenal Bodies.—Both were pale, and contained minute grey tubercles in the cortical zone.

Mesenteric Glands.—Were not apparently enlarged. Each one contained three or more minute grey foci.

The glands on various parts of the stomach, large intestine, and pancreas were similarly affected.

Intestines.—Scattered everywhere in the mucous membrane of the small intestine were minute grey foci: these were moderately numerous in the upper part; scanty elsewhere.

Testicles.—The testicles were intensely red, but there were no tubercles.

Thorax.

Pleura.—Along the margins of the ribs there were some small flattened reddish granulations containing grey translucent tubercles, the size of millet seeds. The pleural surface of the diaphragm showed a few similar granulations, occurring chiefly near the attachments of the caval and mediastinal folds. The folds showed in addition numerous minute grey translucent tubercles.

The abdominal surface of the diaphragm was normal.

Lungs.—Weighed 5 lbs. The cephalic and middle lobes and anterior halves of the posterior lobes were completely consolidated, firm, dull red in colour, and sank in water: the posterior parts of the posterior lobes were on section congested, friable, and yielded a frothy serum on squeezing. Pieces just floated in water.

Evenly distributed in every part of the lungs were numberless grey tubercles, smaller than mustard seeds.

Mediastinal Glands.—Were enlarged to about twice the normal; the long caudal gland had a length of 2½ in. on section they were all very congested and oedematous, the cortex in each case showed throughout small masses of closely aggregated greyish yellow tubercles.

Bronchial Glands.—Were similarly affected.

A gland below the trachea, at the opening of the thorax, was enlarged, and showed a few small grey tubercles.

Heart.—Showed a marked absence of fat. The lymphatics and blood vessels were very prominent on the surfaces of the ventricles. The adipose tissue usually present around the bases of the ventricles was replaced by soft pinkish gelatinous tissue; in this could be seen several minute whitish specks, and just below the right auricular appendix a thin greyish white area. This area by touch could not be differentiated from the tissue in which it lay. The cavities were full of dark red blood clot. In the muscle of the right ventricle, just beneath the endocardium, were two grey foci not larger than pin heads. A slightly larger tubercle was seen in the wall of the right auricular appendix.

Various Lymphatic Glands:

Left Precrural.—1½ in. by ½ in. Congested; contained two groups of tubercles ¼ in. in diameter.

Right Precrural.—Not congested; similarly affected.

The *lumbar* and *iliac glands*, and three small glands at the bifurcation of the aorta, were all enlarged and showed several grey tubercles.

Right and Left Popliteal.—Contained one or two minute grey tubercles.

Gluteal.—Had each a grey tubercle.

Ischiatic.—Normal.

Posterior Pharyngeal and Submaxillary.—Showed several small greyish yellow foci.

Parotid.—Were similarly affected.

The glands near the testicles (*pudic*) showed little grey tubercles.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

Brain and Membranes.—Normal.

Microscopical Examination.

Smears from:—

Emulsion of Prescapular Gland (*used for Guinea-pigs*).—Showed numerous tubercle bacilli.

Right Prescapular Gland.—Showed tubercle bacilli.

Mediastinal Gland.—Showed tubercle bacilli.

Lung.—Showed tubercle bacilli.

Spleen.—Showed tubercle bacilli.

Liver.—Showed a few tubercle bacilli.

Kidney.—Showed numerous tubercle bacilli.

Gall Bladder.—Showed tubercle bacilli.

Tubercle in Auricle.—Showed tubercle bacilli.

A Suprarenal Body.—Showed tubercle bacilli.

Paraffin Sections.

Sections through one of the tuberculous haemolymph glands showed nodules of small round cells, the central parts of which were necrosed; in these areas vast numbers of tubercle bacilli were seen.

Guinea-Pigs Inoculated.

An emulsion was made from pieces of the left prescapular gland; with this emulsion:—

G.P. 638., G.P. 639.—Were inoculated subcutaneously.

G.P. 640., G.P. 641.—Were inoculated intraperitoneally.

The first two died of general tuberculosis in 35 and 31 days respectively; the last two of acute tuberculosis in 12 days.

CALF 122.

Subcutaneous Inoculation of an emulsion made from the tuberculous organs of Monkey 62, fed with milk of Cow 72.

Dose—932,800 tubercle bacilli in 22 cc. of the emulsion.

Date—September 8th, 1903.

Weight—2 qrs. 3 lbs.

Age—13 weeks.

Killed—November 11th, 1903. 64 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 8th, 1903.

On the next day there was a small œdematous swelling which diminished slightly in size during the following two or three days and then began to grow firmer and larger.

On the ninth day there was a tumour about 2 in. in diameter. On September 25th, 17 days after inoculation, the tumour measured 3¾ in. in greatest length, 2½ in. in breadth, and about 1 in. in thickness; it was pear-shaped in outline, the narrowest part of the tumour being directed downwards; the skin was intimately adherent to it; the prescapular gland measured 3 in. in length.

On October 10th, the tumour measured 7 in. by 4½ in. by about 3 in. in thickness and was very heavy and hard and becoming pendulous. The tumour increased still further in size and became more rounded in outline and very pendulous. On October 15th a distinct sense of fluctuation was obtained, and on November 10th the tumour appeared to be softened throughout. The prescapular gland had increased in size and measured over 5 in. in length.

For the first 17 days the calf suffered from severe diarrhœa and the general condition was not very good. From September 25th the calf gradually improved in health, and during the rest of the experiment enjoyed moderately good health and had a fair appetite; the diarrhœa diminished, became less frequent, and then subsided; the calf, however, did not grow and throughout the experiment was thin, though not markedly emaciated; the respirations were never noticeably increased in frequency.

Weights.

	qrs.	lbs.
September 8th, 1903 - - - -	2	13
September 19th, 1903 - - - -	2	17
September 22nd, 1903 - - - -	2	14
September 29th, 1903 - - - -	2	23
October 6th, 1903 - - - - -	2	22
November 3rd, 1903 - - - - -	3	21
November 11th, 1903 - - - -	3	21

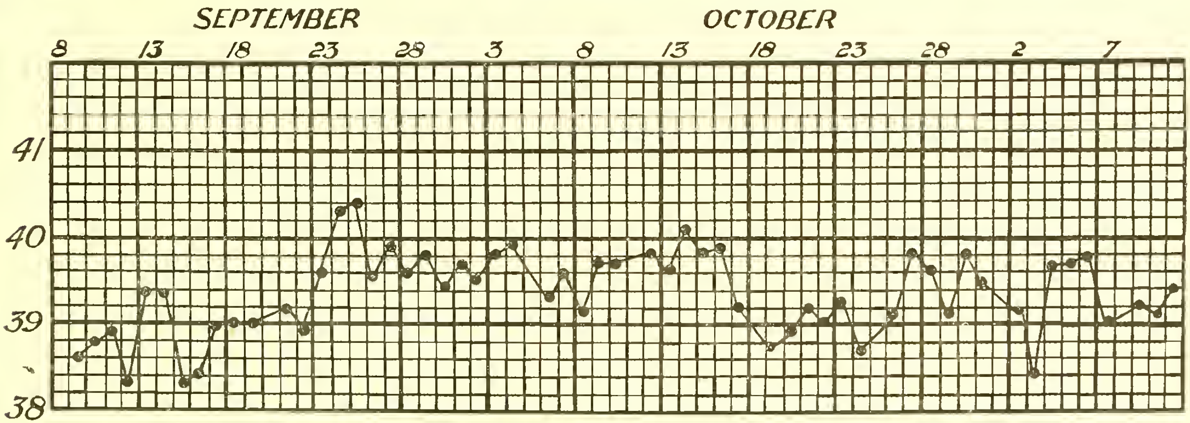
Gain in weight—1 qr. 8 lbs.

Rate of gain per week—3·92 *lbs.*

Tuberculin Test.

November 3rd, 56 days after inoculation. Positive. Rise of temperature, 1·4° C.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—On the left side of the neck there was a large rounded tumour, measuring 8½ in. by 7 in. by 5 in. The tumor was pendulous (the lower margin during life being four inches below the level of the trachea) and gave a distinct sense of fluctuation.

When removed, it weighed, with the skin to which it was attached, 5 lbs. 10 ozs.

On section the tumour was seen to be a large cyst. The contents were a watery, slightly turbid blood stained fluid, and some soft dirty white irregular caseous masses; the fluid altogether amounted to 1,150 cc.

The cyst wall varied in thickness, in no part exceeding two-thirds of an inch; externally it was formed of skin and a thin layer of fibrous tissue and soft breaking down caseous tissue; the part in contact with the deeper structures showed an outer fibrous layer containing here and there caseous foci, and an inner layer of greyish white caseating tissue; the inner surface of the cyst was shaggy, and was formed of breaking down caseous tissue, small shreds of which hung loosely attached.

Between the tumour and the sternum there was a column of pale fibroid tissue, thickly studded with small greyish yellow tubercles; similar tubercles were seen in the subcutaneous tissues around the anterior end of the sternum, spreading on the left side into the axilla.

Left Prescapular Gland.—Weighed 6 ozs., and on section was caseous throughout; the tissue was firm, greyish yellow, with a slight pink tinge; near the periphery of the gland there was a line of more opaque yellow tissue, and between this and the capsule of the gland there was a narrow translucent part dotted with yellow foci; the capsule was thickened and showed numerous yellow points; towards the upper end of the gland there was an irregular cavity (1 in. by ½ in.) in the caseous tissue, which contained a small amount of turbid fluid.

The lower end of the gland was adherent to the tumour by a series of thickened lymphatic vessels presenting caseous nodules.

Right Prescapular Gland.—Weighed 1 oz., and was enlarged and caseous in the lower half, where it was an inch broad.

Prepectoral Glands.—In the left prepectoral region there were four glands; one, the size of a walnut, was entirely caseous; a second, half that size, showed many softened caseous foci; a third and deeper gland contained irregular caseous masses, a small gland near the latter presented one or two caseous foci.

Two Right Prepectoral Glands.—One the size of a pea, the other the size of a kidney bean, showed caseating nodules.

Left Axillary Gland.—No naked eye tubercle.

Cervical Glands.—The glands along the left side of the trachea, three in number, two $1\frac{1}{2}$ in. by $\frac{3}{4}$ in., the third the size of a broad bean, were caseous throughout.

A mid-cervical gland on the right side was enlarged and caseous throughout.

Abdomen.

Omentum.—Devoid of fat, showed on the inferior surface a development of pale granulations.

Peritoneum elsewhere normal.

Spleen.—Weighed $6\frac{1}{2}$ ozs. It contained in the pulp about twenty yellow, caseous and softened nodules, 1·5 to 5 mm. in diameter. The nodules were not appreciably calcareous. Four of the nodules formed rounded projections beneath the capsule near the posterior margin.

Liver.—Weighed 2 lbs. 14 ozs. Showed beneath the capsule from fifteen to twenty greyish white nodules 2 to 5 mm. in diameter, yellow and caseous in the centre; these nodules were embedded in the parenchyma, a few only causing a slight projection; in the depth of the liver substance a moderate number of similar nodules were seen. On the anterior surface of the capsule there was a number of minute hemispherical tubercles, some transparent, the majority translucent; these were arranged chiefly around the tubercles which projected. The posterior surface showed one little group of similar bodies around a surface nodule.

Hepatic Lymphatic Glands.—Were enlarged, and contained discrete yellow nodules 2 to 5 mm. in diameter.

Right Kidney.—Eight ozs. Cortex contained near the surface about six nodules, in size from a shot to a small pea; the largest of the nodules was wedge-shaped: all were greyish with central yellow foci.

Left Kidney.—Seven ozs. Contained in the cortex near the surface two similar nodules 3 mm. in diameter; one of the nodules projected half its diameter beyond the surface; in the deeper layers of the cortex two caseating nodules were seen.

Suprarenal Bodies.—Were normal.

Right Lumbar Gland.—Showed a grey caseating mass affecting about one-third of the cortex.

Left Lumbar Gland.—Contained three small nodules of caseating tissue.

Thorax.

Lungs.—Each lobe contained very numerous nodules ranging in size from a small shot to a mass occupying the whole of a lobule. In the posterior lobes several of the consolidated lobules were grouped together to form tumour masses. In the anterior lobes many of the subpleural tubercles projected considerably. On section the nodules consisted of translucent tissue containing opaque yellow masses which in many of the larger nodules were softened. On the pleura covering some of the larger nodules there were small miliary tubercles resembling those on the surface of the liver; patches of collapse were also seen in the latter lobes.

Pleura.—The fringes along the margins of the lungs and ribs were slightly hypertrophied, and contained a few hard grey tubercles.

Pale granulations were seen on the pleural surface of the diaphragm, on the tendon and along the muscle.

Thoracic Glands.—The long mediastinal gland consisted of two parts, each $3\frac{1}{2}$ in. by 1 in. by $\frac{1}{2}$ in. On section the cortices were almost entirely occupied by greyish yellow masses; the glands anterior to this were enlarged and similarly caseous. The mediastinal glands (five in number) weighed 3 ozs.

The bronchial glands were enlarged to over three times the normal size, and were similarly affected.

Some small glands along the œsophagus contained caseous nodules.

The mediastinal gland just within the entrance to the thorax on the left side was enlarged, and showed a few greyish foci. The corresponding gland on the opposite side and the ventral mediastinal glands were not apparently affected.

Heart.—Normal.

Alimentary Tract.

Pharynx, Larynx and Tonsils.—Normal.

Posterior Pharyngeal, Submaxillary and Parotid Glands.—Normal.

A *Gastric Gland* showed a greyish nodule containing yellow foci.

Intestines.—Normal throughout.

Mesenteric Glands.—A gland at the posterior end of the mesentery contained a grey caseating nodule half an inch in diameter; a second gland slightly anterior contained a similar nodule a quarter of an inch in diameter.

Other Mesenteric and Colic Glands.—Normal.

Genito-Urinary System.

Uterus, Ovaries and Fallopian Tubes.—Normal.

Mammary and Supramammary Lymphatic Glands.—Normal.

Various Lymphatic Glands.

Right Precrural.—Contained a yellow softened tubercle.

Left Precrural.—Normal.

Right and Left Popliteal.—Normal.

Right and Left Gluteal.—Normal.

Right and Left Ischiatic.—Normal.

Right and Left Iliac.—Normal.

Right Axillary.—Normal.

A Hæmo-Lymph Gland near the left prescapular gland contained a nodule.

Microscopical Examination.

Smears from :—

Local Tumour Fluid.—Tubercle bacilli.

Left Prescapular Gland Emulsion.—Tubercle bacilli.

Spleen.—Tubercle bacilli.

Lung.—No tubercle bacilli.

Animals Inoculated.

With Emulsion of Left Prescapular Gland.

G.P. 691. G.P. 692.	Subcutaneously: died of general tuberculosis in 71 and 47 days respectively.
G.P. 673. G.P. 694.	Intraperitoneally: died of general tuberculosis in 25 and 29 days respectively
Rabbit 9.	Inoculated intravenously: died of general tuberculosis in 45 days.
Rabbit 10.	Inoculated subcutaneously: died of general tuberculosis in 96 days.

VIRUS B 1.

CULTURE INOCULATIONS.

TABLE 1 D.

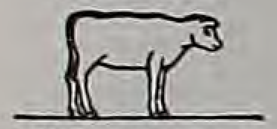
VIRUS B. I. (MAY 6, 1902.)

CULTURE INOCULATIONS.

Animals inoculated with different strains of Virus B. I.

Inoculated on November 11, 1904, with culture derived from Cow 40.
The sub-culture was 21 days old, 18th generation; the total age of the culture was 640 days.

CALF 222.



Subcutaneous.
Dose: 50 mg.
Died December 16, 1904.
35 days.
P.M. — Large necrotic tumour: miliary tuberculosis.

CAT 28.
Subcutaneous.
Dose: 1·0 mg.
Killed in a dying condition, December 31, 1904.
49 days after inoculation.
P.M.—Caseous ulcer: neighbouring glands caseous: lungs packed with grey miliary tubercles, thoracic glands caseous.

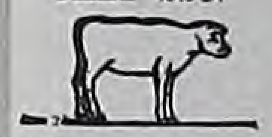
CAT 26.
Subcutaneous.
Dose: 1·0 mg.
Killed when very ill, December 17, 1904.
35 days after inoculation.
P.M.—Caseous ulcer: neighbouring glands caseous: lungs partly solid were packed with grey miliary tubercles: thoracic glands enlarged and caseous.

RABBITS.

No.	Dose.	Method.	Duration of Life.	Result.
138	0·1 mg.	Intrav.	34 days	G.T.
137	1·0 mg.	Intrap.	31 days	G.T.
136	1·0 mg.	Subcut.	82 days	G.T.

Inoculated on December 21, 1904, with culture derived from Cow 44.
The sub-culture was 20 days old, 8th generation; the total age of the culture was 341 days.

CALF 228.



Subcutaneous.
Dose: 50·0 m.g.
Killed when very ill, February 2, 1905.
43 days after inoculation.
P.M.—Caseo-necrotic tumour, with a central cavity: general tuberculosis.

RABBITS.

No.	Dose.	Method.	Duration of Life.	Result.
5 rabbits	0·1 mg.	Intrav.	21 days (average)	G.T.
83	0·1 mg.	Subcut.	105 days	G.T.
84	0·1 mg.	Subcut.	68 days	G.T.

Inoculated on January 10, 1905, with culture derived from Pig 16.
The sub-culture was 20 days old, 10th generation; the total age of the culture was 360 days.

RABBITS.

No.	Dose.	Method.	Duration of Life.	Result.
158	1.0 mg.	Intrap.	62 days	G.T.
159	1.0 mg.	Intrav.	21 days	G.T.

PIG 96.
Subcutaneous.
Dose: 0·1 mg.
Killed September 7th, 1905, 240 days after inoculation.
P.M.—Small caseous lesion; nearest glands caseous; sparsely scattered tubercles in the lungs; there were three small tubercles in the spleen and numerous nodules in the liver; many lymphatic glands were tuberculous, including the thoracic; there were a few nodules on the diaphragm and stomach.

CALF 230.

Subcutaneous.
Dose: 50·0 mg.
Died February 13th, 34 days after inoculation.
P.M.—Elongated caseo-necrotic tumour with cavity in upper part: general tuberculosis.

PIG 98.
Subcutaneous.
Dose: 1·0 mg.
Died March 29th, 1905.
78 days after inoculation.
P.M.—Small local lesion; one inguinal gland partly caseous; a few tubercles in the liver and spleen, and numerous tubercles in the lungs which showed some areas of consolidation; tuberculosis of pleura and diaphragm.

Note.—The full post-mortem notes of Calf 230 and Pigs 96 and 98 are given in the Report on "Modification Experiments with Tubercle Bacilli of Bovine Origin." (See Appendix, Vol. III.)

CALF 222.

Subcutaneous.—Inoculation of culture obtained from Cow 40.

Dose.—50 milligrammes.

Date.—November 11th, 1904.

Age.—3 months.

Died.—December 16th, 1904. (35 days after inoculation).

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on November 11th, 1904.

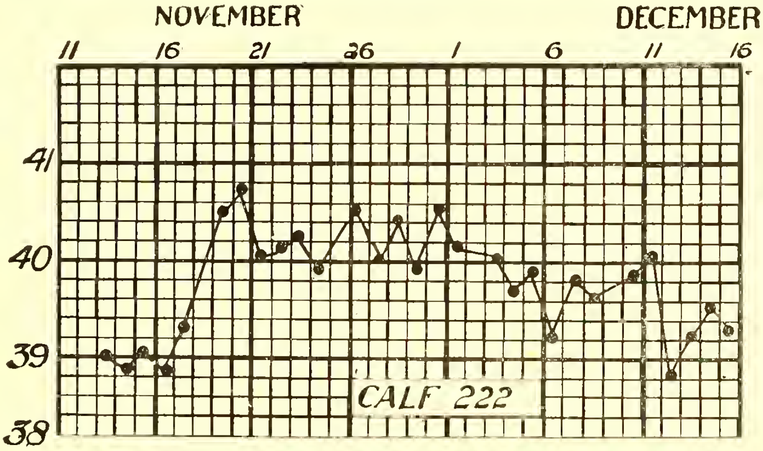
Ten days after inoculation there was a firm projecting swelling 2¼ in. in diameter continued downwards into the dewlap as a thin œdematous band 2½ in. in length by 1 in. in breadth; the prescapular gland measured 2½ in. in length.

Three weeks after inoculation there was a very large prominent tumour measuring 7 in. from above downwards and 3 in. from side to side; the prescapular gland was about 4½ in. in length and the prepectoral glands were slightly enlarged.

Subsequently there was no further increase in the size of the tumour, or in that of the gland.

On December 10th, 1904, the calf was seen to be losing flesh and to be becoming weaker; the weakness rapidly increased and for five days before death the calf was unable to rise from the ground or to stand upon its legs when lifted up. The respirations were not obviously increased in frequency and were at no time laboured or jerky.

Temperature.



Weights.

The calf lost steadily in weight from the beginning of the experiment.

		cwt.	qrs.	lbs.
November 15th, 1904	- -	0	3	1
December 7th, 1904	- -	0	2	20
December 16th, 1904	- -	0	2	9

Average loss per week.—4·5 lbs.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a firm elongated tumour measuring 7 in. vertically, 3 in. in greatest breadth, and 1½ in. in greatest thickness. On section the mass of the tumour was composed of pinkish yellow necrotic tissue, to which the skin and underlying muscles were firmly adherent. In the centre of the upper part of the tumour there was a flat irregular space filled with clear reddish fluid, around which the necrosed tissue was sodden and friable. External to this space the skin was infiltrated up to the surface, and showed an area of ulceration half an inch in diameter; other parts of the skin were studded with congested caseous foci; the muscles were fibroid and infiltrated with yellow tubercles for a depth of a quarter of an inch.

Left Prescapular Gland.—Weighed 5 ozs., and measured 4 in. by 2 in. by 1½ in. On transverse section it was triangular in outline, and consisted throughout the cortex of dense pinkish yellow necrotic tissue; the medulla was fibroid and studded with yellow tubercles; the capsule was thickened.

Prepectoral Glands.—The rounded prepectoral was the size of a small walnut, and on section resembled the prescapular. The kidney-shaped gland was enlarged and œdematous, and contained a few caseous tubercles; a deeper and smaller prepectoral gland contained numerous tubercles.

Abdomen.

Omentum.—The inferior surface of the omentum showed fairly numerous nodules ranging in size from a small shot to a wheat grain; the nodules were congested and opaque yellow in the centre.

There was a slight excess of fluid in the peritoneal cavity.

Spleen.—4½ ozs. Not obviously enlarged; showed in the pulp shot-sized tubercles, opaque in the centre, and crowded closely together.

Liver.—Weighed 2 lbs. 4 ozs. The substance was firm and fairly normal in colour; it contained numerous pearly grey tubercles, mostly about the size of pin's heads; the larger ones had minute opacities.

Gall Bladder.—Distended with bile; showed on the mucous surface several small caseous ulcers, covered with bile-stained mucus; there were also a few sub-mucous caseous foci, the size of mustard seeds.

Portal Glands.—Were greatly enlarged; the cortices were closely beset with nodules and nodular masses of grey translucent tissue studded with caseous foci.

Kidneys.—Left kidney showed on the surface not more than a dozen grey miliary tubercles, slightly opaque in the centre; no tubercles were seen on section.

Right kidney showed a similar number of tubercles on the surface, and two or three in the depth of the cortex.

Suprarenal Bodies.—Each contained a minute grey tubercle.

Thorax.

Heart, Pericardium.—Normal.

Pleura.—On the pleural surface of the tendon of the diaphragm there were two flattened opaque yellow tubercles 2 millimetres in diameter. Along the margins of the ribs on the right side there were scattered some similar tubercles ; on the left side there were a few minute grey granules.

Lungs.—The lungs showed numerous grey miliary slightly opaque tubercles evenly distributed throughout the substance ; the right caudal lobe was almost completely hepatised, and the middle and cephalic lobes showed large patches of consolidation ; in the left lobes many of the tubercles were surrounded by small irregular red congested zones, but there were no large areas of consolidation (the calf lay for three or four days before death on its right side, and to this was due the difference in the amounts of consolidation in the two lungs.

Thoracic Glands.—The thoracic glands were moderately enlarged. The caudal mediastinal gland measured 4 in. by $1\frac{1}{3}$ in. by $\frac{1}{3}$ in. All showed in the cortices grey translucent tissue far advanced in caseation and necrosis.

The bronchial and infratracheal glands were similarly affected.

The ventral mediastinal glands were slightly enlarged and beset with caseating nodules, the largest 2 millimetres in diameter.

Alimentary Tract.

Tonsils.—Both contained caseous nodules.

Under the mucous membrane between the epiglottis and the base of the tongue there were several pinhead-sized caseous tubercles ; there were two similar tubercles in the larynx.

Small Intestine.—Distributed throughout the whole length of the small intestine, under the mucous membrane, there were numerous pinhead-sized caseous tubercles. Similar tubercles were seen under the mucous membrane of the colon. In the caecum there were some minute erosions of the mucous membrane.

Mesenteric Glands.—Were slightly enlarged and extensively tuberculous ; the cortices of many were tuberculous throughout ; others were packed with nodules that remained more or less discrete.

Ileo-Colic Glands.—Similarly affected.

Gastric Glands, Colic Glands.—All were closely beset with caseating nodules.

Various Lymphatic Glands.

Precrural Glands.—Were not obviously enlarged, but contained numerous discrete caseating tubercles similar to those in the ventral mediastinal.

Popliteal Glands, Gluteal Glands, Pudic Glands, Iliac Glands, Sacro-Iliac Glands, Œsophageal Glands, Axillary Glands, Right Prescapular Gland, Right Prepectoral Gland, Right Cervical Glands, Left Mid-Cervical Glands, Left Lower Cervical Glands.—Resembled the precrural.

Pharyngeal Glands, Submaxillary Glands, Parotid Glands, Left Upper Cervical Glands.—Were slightly enlarged, and very closely beset with caseating nodules, all of which, however, remained discrete.

Cœliac Glands.—Resembled the portal.

Lumbar Glands.—Were enlarged, and beset with tubercles, which had here and there coalesced.

Renal Gland.—Was similarly affected.

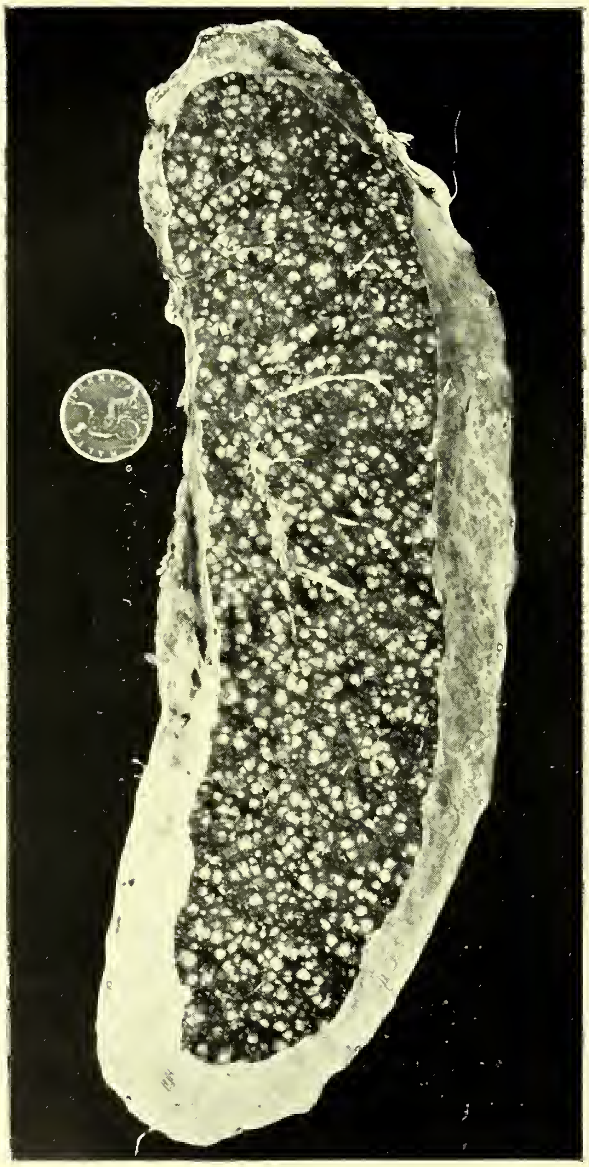
Testicles.—Normal.

Microscopical Examination (*Smear Preparations*).

Right Tonsil.—Very numerous beaded tubercle bacilli.

Gall Bladder (caseous tubercle).—Moderately numerous tubercle bacilli.

Large Intestine (submucous tubercle) - - - -	Moderately numerous tubercle bacilli.
Laryngeal Tubercle - - -	
Right Suprarenal Body - -	



CALF 228. Subcutaneous. Virus B. I.
Spleen.

Vol. I.

(To face page 99.)

CALF 228.

Subcutaneous.—Inoculation of culture obtained from the supramammary lymphatic gland of Cow 44.

Dose.—50 milligrammes.

Date.—December 21st, 1904.

Age.—15 weeks.

Killed.—When dying, February 2nd, 1905. (43 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on December 21st, 1904.

Nine days after inoculation there was a firm prominent rounded tumour 3 in. in diameter; the prescapular gland measured about 3 in. in length.

On January 12th, 22 days after inoculation, the tumour measured 4 in. by 3 in. and was very prominent and hard; it was joined to the prescapular gland by several thick cords; the prescapular gland measured 4 in. in length and the spherical prepectoral gland was the size of a walnut. On this day the general condition of the calf was not good; the coat was rough and the appetite very poor; the respirations were not, however, increased in frequency.

On January 20th, a small opening appeared in the skin over the tumour through which yellow serous fluid was discharged.

On January 23rd, the tumour had increased in size and was united to the prescapular gland by thickened and infiltrated muscles; the respirations were slightly increased; there was occasional cough and the animal appeared to be losing flesh.

The calf rapidly got worse and on January 30th was emaciated and so weak that it was unable to rise from the ground; the respirations were increased in frequency and very laboured. It became more gravely ill and was killed in a dying condition on February 2nd, 1904.

Weights.

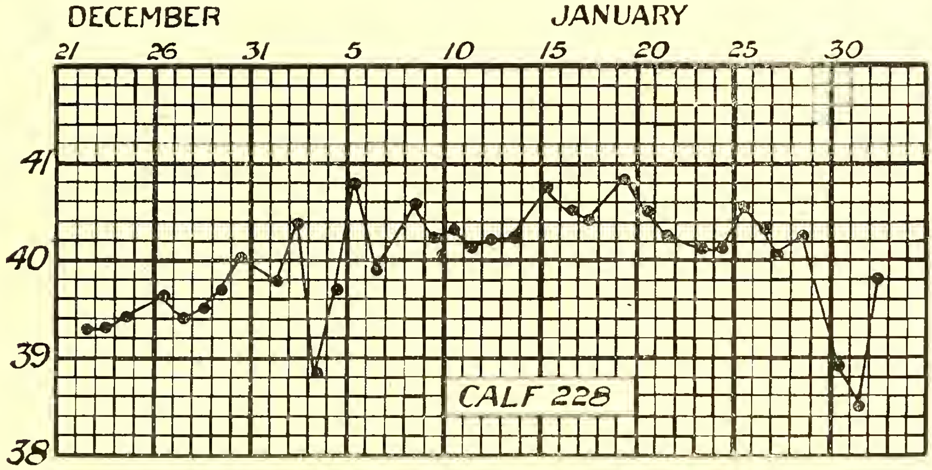
There was a steady decline in weight.

	cwt.	qrs.	lbs.
December 27th, 1904 - -	1	0	0
February 2nd, 1905 - -	0	3	7

Loss in weight.—21 lbs.

Average Loss per Week.—3·99 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a firm tumour, measuring $4\frac{1}{4}$ in. by 3 in. by $1\frac{1}{2}$ in., and weighing, with the skin and muscle to which it was attached, 10 ozs. On section the body of the tumour was composed of tough caseo-necrotic tissue, showing in the upper part an irregular cavity filled with turbid serous fluid. The skin was thoroughly adherent, and infiltrated right up to the surface with yellow caseous tubercles; the epidermis over the centre of the tumour had necrosed, and was covered with dried discharge. The muscles under the tumour were closely studded with yellow nodules, and those between the tumour and the prescapular gland were infiltrated and extensively caseated.

Left Prescapular Gland.—Weighed 6 ozs., and measured $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $1\frac{3}{4}$ in. On section it was composed throughout of dense yellow caseated tissue, showing here and there hæmorrhagic points; the capsule was thickened, and on the side nearest the local tumour infiltrated with caseous tubercles.

The tissues around the local tumour and prescapular gland were moderately œdematous.

Left Prepectoral Glands.—The rounded prepectoral gland measured 1 in. in diameter, and on section resembled the prescapular; extending from the local tumour to this gland was a thick caseous lymphatic vessel.

The kidney-shaped prepectoral gland, the size of a filbert, was firm, and studded with minute grey foci.

Near the latter were two small œdematous glands, which showed small caseating nodules.

A gland lying just in front of the first rib, under the left scalenus anticus, was much enlarged, and on section caseous throughout (not so advanced as the prescapular).

Right Prescapular Gland.—Contained one caseous tubercle the size of a shot.

Right Axillary Gland.—Contained a similar tubercle.

Prepectoral Glands.—A right prepectoral gland, the size of a marble, was caseating throughout.

Cervical Glands.—One of the lower cervical glands was enlarged, firm, and similar on section to the above.

All the other cervical glands showed caseating nodules.

Abdomen.

Omentum.—The omentum, on its inferior surface, showed in the centres of the polygonal areas between the vessels clusters of minute grey granules; there were besides about half-a-dozen firm caseating nodules, the largest the size of a wheat grain.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 1 lb. Surface normal; pulp closely packed with firm caseating nodules, 2 to 4 millimetres in diameter.

Liver.—Pale. Showed on the surface and on section moderately numerous caseating nodules, 1 to 2 milimetres in diameter; also innumerable minute greyish white foci.

Portal Glands.—Were enlarged, and showed in the cortices confluent caseating nodules.

Gall Bladder.—Normal.

Kidneys.—Left kidney showed on the surface about twelve caseating tubercles 1·5 to 2·5 millimetres in diameter; the larger ones extended into the cortex in a wedge-shaped manner. Close inspection revealed also a few very minute tubercles. Similar tubercles were seen in the depth of the cortex.

Right kidney contained about the same number of tubercles as the left, but two or three were larger, and appeared as if made up of several small tubercles grouped together.

Suprarenal Bodies.—Contained a number of minute grey-white foci, situated chiefly in the cortical zones.

Thorax.

Heart.—Adhering to the pericardial surface of the heart were some patches of fibrin, in which minute tubercles could be seen. Under the endocardium of the right ventricle there was a minute whitish tubercle.

Pleura.—The fringes around the margin of the central tendon showed here and there little groups of grey granules.

Parietal Pleura.—Appeared normal.

Lungs.—Contained moderately numerous discrete caseating tubercles of various sizes, the largest about 2 millimetres in diameter, the smallest less than a pin's head in size. The cephalic lobes and extreme antero-ventral portions of the caudal lobes were consolidated and dark red in colour. In the rest of the caudal lobes there were isolated consolidated lobules.

The fringes around the margins of the lungs were in places slightly hypertrophied, and showed minute tubercles.

Mediastinal Glands.—Dorsal mediastinal glands were moderately enlarged, weighing together $2\frac{1}{2}$ ozs. On section the cortices were composed throughout of firm grey tissue, far advanced in caseation.

Bronchial Glands, Peribronchial Glands, Infratracheal Glands.—Were also enlarged, and resembled on section the mediastinal.

The ventral mediastinal glands contained a few small tubercles.

Alimentary Tract.

Tonsils.—Normal.

Tongue.—Some of the lymphoid follicles at the base of the tongue were congested and ulcerated, but were not definitely caseous.

Small Intestine.—Showed sparsely scattered caseous tubercles over which the mucous membrane was congested and beginning to ulcerate.

Large Intestine.—The cæcum and colon showed tubercles similar to those in the small intestine, but only one or two of these were ulcerated.

Mesenteric Glands.—Were not enlarged. Almost all contained one or two caseating nodules, the largest 4 millimetres in diameter.

Similar nodules were seen in the gastric and colic glands.

Ileo-Colic Glands.—Were more severely affected.

Various Lymphatic Glands.

Gluteal, Popliteal, Precrural.—Each contained from three to six caseating nodules.

Iliac, Sacro-Iliac, Left Axillary, Parotid, Pudic.—Each contained from three to six caseating nodules.

Cœliac Glands.—Were enlarged, and consisted throughout of firm grey tissue, studded with opaque yellow foci.

The glands around the pancreas, the lumbar, and renal glands, were closely beset with caseating nodules.

Submaxillary and Pharyngeal Lymphatic Glands.—Contained numerous discrete caseating nodules.

Testicles.—Normal.

Microscopical Examination.

Ventral Mediastinal Gland.—One tubercle bacillus.

Tubercle from Colon.—A few tubercle bacilli.

Tubercle from Left Suprarenal *Tubercle from Heart* *Lymphoid Follicle at Base of Tongue*	No tubercle bacilli.

VIRUS B I.

MONKEY PASSAGE EXPERIMENT.

MONKEY PASSAGE EXPERIMENT.

TABLE 1E.

VIRUS B I. MAY 6, 1902.

BOVINE LUNG AND GLAND.

GUINEA-PIGS.

Emulsion of Guinea-pig Organs. May 24, 1902.

G.P. 59. Died, 58 days. G.T. S.

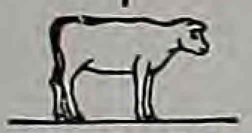
G.P. 130. Died, 52 days. G.T. S.

September 11, 1902.

MONKEY 2. Subcut.
Died, October 22, 1902.
(41 days.)
P.M. General tuberculosis.

MONKEY 4. Intrav.
Died, September 26, 1902.
(15 days.)
P.M. Acute general tuberculosis. No guinea-pigs inoculated.

Spleen.



CALF 52. Subcut.
Killed, when well, November 23, 1902.
(32 days.)
P.M. Large local lension; neighbouring glands tuberculous; a few tubercles in liver, spleen, and kidneys; numerous tubercles in lungs and thoracic glands.

GUINEA-PIGS.

Precrural	242	350	D.	77 days	G.T.	S.
Spleen -	243	360	D.	79 „	G.T.	S.
Liver -	244	330	D.	116 „	G.T.	S.
Lung -	245	245	D.	49 „	G.T.	S.

GUINEA-PIGS.

Spleen	204	350	D.	50 days	G.T.	S.
	205	360	D.	10 „	T.P.	I.
Liver	206	370	D.	73 „	G.T.	S.
	207	330	D.	13 „	T.P.	I.

MONKEY 20. Intraven.
Died, October 31, 1902.
(9 days.)
P.M. No definite tuberculous lesions, but T.B. found in all the organs.

Spleen.

GUINEA-PIGS.

Bronchial gland-	218	500	D.	65 days	G.T.	S.
Lung - - -	219	350	D.	32 „	G.T.	S.
Liver - -	220	350	D.	50 „	G.T.	S.
Spleen - -	221	450	D.	46 „	G.T.	S.

MONKEY 18. Subcut.
Killed, November 17, 1902.
(17 days.)
P.M. Local abcess; adjoining glands caseous; liver and spleen beset with small tubercles; a few minute tubercles in the lungs and bronchial glands.

Spleen.

CALF 48. Subcut.
Killed, May 21, 1903.
(185 days.)
P.M. Local ulcer; fibroid tumour: neighbouring lymphatic glands tuberculous; numerous tubercles in the lungs and thoracic glands; a few in the liver, spleen, and right kidney; intestines and mesenteric glands affected.

GUINEA-PIGS.

Precrural gland -	406	660	D.	89 days	G.T.	S.
	407	750	D.	94 „	T.	S.
	408	850	D.	73 „	G.T.	I.
Mesenteric gland -	409	570	D.	42 „	G.T.	S.
Spleen - - -	410	570	D.	56 „	G.T.	S.

GUINEA-PIGS.

Spleen	238	320	D.	55 days	G.T.	S.
	239	370	D.	12 „	T.	S.
Liver -	240	410	D.	67 „	G.T.	S.
Kidney -	241	350	D.	57 „	G.T.	S.

MONKEY 22. Subcut.
Died, December 30, 1902.
(43 days.)
P.M. Local ulcer; tuberculous inguinal and pelvic glands; a few small tubercles in lungs, liver, spleen, and a gastric gland.
No Guinea-pigs were inoculated.

VIRUS B I.

MONKEY PASSAGE EXPERIMENT.

(*Note by Dr. Cobbett.*)

The object of this experiment was to pass a virus of known high virulence for the ox species through a series of monkeys (Rhesus)—chosen as the nearest easily available species to man—in order to see whether it would lose any of its virulence for the ox, and so approximate to the common bacillus of human tuberculosis (Group II.). Accordingly Virus B I was chosen, and a monkey, No. 2, injected subcutaneously with an emulsion of the tuberculous organs of Guinea-pig 130. This animal died of general tuberculosis in 41 days.

An emulsion was made from its spleen, and injected intravenously into Monkey 9. This animal died nine days later, and though no definite tubercles were seen, nevertheless tubercle bacilli were found in all the organs.

The spleen of this monkey was emulsified, and some of it was injected subcutaneously into Monkey 18. This animal was killed 17 days later when moribund, and found to have general tuberculosis.

The virus had up to this time passed through three monkeys in succession, and had thus been living in Simian tissues for a little over two months (9½ weeks). The question was: Had it thereby lost any of its virulence for the ox?

Previous to the injection of the first monkey the virus, in doses unestimated as to number of tubercle bacilli, but doubtless large, had caused very acute and fatal tuberculosis in Heifer 8 (subcutaneously injected), Heifer 24 (intravenously injected), and Cow 18 (injected into the milk ducts of the mammary gland). The virulence for the ox species was therefore known to be high.

An emulsion of the spleen of the first monkey, No. 2, was injected subcutaneously into Calf 52. The animal was killed 32 days later on account of having severe fits. It was found to have early general tuberculosis, not at all severe as yet.

After the virus had passed through three monkeys, having, as already stated, lived in Simian tissues for nine and a half weeks, its virulence for the ox species was again tested. An emulsion was made of the spleen of Monkey 18, and subcutaneously injected into Calf 48. This animal developed a very large tumour at the seat of injection, which became necrotic in the centre, and after the separation of a slough resulted in a very large ulcer. This ulcer ultimately underwent a considerable degree of contraction. The animal recovered from the indisposition which followed the injection, and continuing to improve and gain weight, was in very fair general condition when killed 185 days after injection.

This result then was quite unusual. We had not up to that time had so slight a result follow an injection of bovine tubercle bacilli. The virulence of the virus for the calf appeared to have diminished.

The virus was passed from 18 into yet another monkey, No. 22, but the appearance of spontaneous tuberculosis in a recently imported Rhesus, living in the same house, put an end to the experiment, and introduced a doubt as to whether the first monkeys used in it might not possibly have been infected with tuberculosis before their arrival at Walpole. In subsequent experiments on monkeys, only animals that had passed through the quarantine station at Isleworth were used.

The experiment at best was only a rough one. At the time it was carried out no method of enumerating the number of bacilli injected in a dose of tissue emulsion had been introduced. Such an experiment, therefore, could only be expected to show a change of virulence, if it were of a very marked character. Subsequent experience showed the great influence of the numbers of bacilli in the injected material, and also the great difference of susceptibility of different individual calves.

No conclusion, therefore, can be drawn from this experiment. It has been allowed to appear because use has been made by Dr. Eastwood of some of the animals for histological purposes.

MONKEY 2 (Monkey Passage Experiment).

Subcutaneous: Inoculation of tuberculous lesions from Guinea-pig 130.

Dose: Not estimated.

Date: September 11th, 1902.

Died: October 22nd, 1902. (41 days.)

Clinical Notes.

The animal quickly developed signs of severe infection. Its temperature rose eight days after inoculation to 104·4°, and a week later reached 107°. The monkey became rapidly worse, and died of general tuberculosis 41 days after the commencement of the experiment.

POST-MORTEM EXAMINATION.

Axillary Glands, Inguinal Glands, Iliac Glands.—Enlarged and caseous.

Liver.—Contained numerous tubercles.

Spleen.—Enlarged and full of tubercles.

Suprarenals.—Contained tubercles in the cortex.

There was an alveolar abscess containing tubercle bacilli, and a gland near the hyoid bone containing a tubercle in its cortex.

Cæcum, Large Intestine.—A few tubercles under the mucous membrane.

Cæcal and Mesenteric Glands.—Normal in appaarance, but contained tubercle bacilli.

Lungs.—Contained shot-like tubercles.

Bronchial Glands.—Were affected.

GUINEA-PIGS INOCULATED.

Two guinea-pigs inoculated with an emulsion made from the spleen, and two with an emulsion made from the liver, died of tuberculosis.

MONKEY 4 (Monkey Passage Experiment).

Intravenous: Injection of an emulsion of the tuberculous organs of Guinea-pig 130.

Dose: Not estimated.

Date: September 11th, 1902.

Died: September 26th, 1902. (15 days.)

Clinical Notes.

The wound made by the intravenous injection did not heal well. It broke down, and eventually became a deep and foul ulcer. The animal showed no impairment of health during the first ten days, but then began to cough and lose strength. On the 13th day she was obviously very ill and weak, and she died 15 days after inoculation.

Temperature.

The temperature rose on the 10th day to 106°, and remained over 105° till just before death, when it fell to 96°.

POST-MORTEM EXAMINATION.

Numerous early tubercles and tubercle bacilli were found in nearly every organ. There was a deep septic ulcer at the seat of inoculation, and the surrounding tissue was infiltrated with caseating matter containing tubercle bacilli.

Femoral Glands, External Iliac. and Lumbar Glands.—Were all affected, and contained tubercle bacilli.

Tongue, Palate, Larynx, Tonsil.—Appeared normal. Tubercle bacilli found in tonsil.

Small Intestine.—Contained minute whitish spots containing tubercle bacilli.

Mesenteric Glands.—Affected.

Liver.—Contained minute tubercles.

Spleen.—Contained no visible tubercles, but tubercle bacilli were found.

Kidneys.—Appeared normal, except for one minute white speck in the cortex of one.

Lungs.—Numerous minute yellowish white tubercles.

Bronchial Glands.—Tuberculous.

Brain.—Healthy.

Microscopical Examination.

Tubercle bacilli in large numbers were found in all the organs, and the bacilli were remarkably long.

It was considered possible that the death of this animal had been caused by septicæmia. In order to test this Guinea-pig 175 was injected subcutaneously with serum of Monkey 4. The blood was not taken directly from the heart, but after it had flowed into the peritoneal cavity. This guinea-pig escaped acute infection, but became tuberculous.

No animals other than this guinea-pig were inoculated with the virus of Monkey 4.

MONKEY 20 (Monkey Passage Experiment).

Intravenous: Injection of emulsion of spleen of Monkey 2.

Dose: Not estimated.

Date: October 22nd, 1902.

Died: October 31st, 1902. (9 days.)

Clinical Notes.

The puncture made by the needle at the time of injection healed at once, and no ulcer or wound resulted as in the case of Monkey 4. The animal became rapidly ill and died 9 days after inoculation.

POST-MORTEM EXAMINATION.

There was no sign of any lesion at the seat of inoculation.

Popliteal Gland.—Normal, contained no tubercle bacilli.

Inguinal Glands.—Were probably a little larger than normal, and they were more congested, but no tubercle bacilli could be found.

External Iliac Glands.—The same.

Mouth.—There was some congestion of the mucous membrane and round certain of the teeth (four lower incisors and left upper lateral incisor); this showed up on the otherwise pale mucous membrane.

The nasal surface of the palate and the nasopharynx generally was congested.

Œsophagus, Larynx, Trachea.—Normal.

Stomach.—Showed numerous dark pink spots in the mucous membrane near the pylorus, which did not fade on pressure. The pylorus was dark red, as also the duodenum and the rest of the small intestine. Just beyond the pylorus were several patches, dark grey in the middle and yellowish brown around, which appeared to be ulcers.

The congestion of the mucous membrane extended to the ileo-cæcal valve, and stopped rather abruptly there It was most intense in the duodenum.

Colon.—Contained a considerable quantity of normal cæcal matter; the small intestine little, but much bile-stained mucus.

The Mesenteric Glands, the Mesocolic Glands, and especially those in the angle between the cæcum and lower end of the ileum, were slightly enlarged and congested.

Liver.—Was a pale brownish colour. On its upper surface were parts which were of a redder colour. It looked perfectly normal in structure.

Spleen.—Also appeared normal in structure and size, and was of the usual dark blue purple colour.

Kidneys.—Showed nothing abnormal.

Lungs.—Appeared to be healthy.

Bronchial Glands.—Were not enlarged.

There was no excess of pleural fluid.

Heart.—Showed no departure from the normal, unless indeed there may have been a slight excess of pericardial fluid.

Testes, Suprarenals, Pancreas, Salivary Glands.—Looked healthy.

Microscopical Examination of Crushed Organs.

Popliteal Gland (L) *Inguinal Gland* (L)	No tubercle bacilli.
Lung, Bronchial Gland *Liver and Spleen* - -	Tubercle bacilli numerous.

Mesenteric Gland.—No tubercle bacilli.

The bacilli were observed to be shorter and thicker in the lung and bronchial gland than in the liver and spleen.

Guinea-Pigs Inoculated.

Four guinea-pigs were inoculated subcutaneously, one from the spleen, one from the liver, one from the lung, and one from the bronchial gland; all died of general tuberculosis in periods varying from 32 to 65 days.

MONKEY 18 (Monkey Passage Experiment).

Subcutaneous: Inoculation of emulsion of spleen of Monkey 20.

Dose: Not estimated.

Date: October 31st, 1902.

Killed: November 17th, 1902. (17 days.)

Clinical Notes.

A small ulcer formed at the seat of inoculation. The animal became rapidly ill and was in a dying condition when killed on November 17th, seventeen days after the commencement of the experiment.

POST-MORTEM EXAMINATION.

At the seat of inoculation in upper part of left calf there was a subcutaneous collection of pus discharging through a minute opening, forming a swelling 1 in. by ½ in. Contiguous to it was the popliteal gland, caseous and softened.

Left Inguinal Gland.—Was a little enlarged, and contained numerous closely packed tubercles in the cortex.

Liver.—Was pale and everywhere beset as closely as possible with very minute yellowish-white foci; it appeared to be enlarged.

Spleen.—A little enlarged; was also closely beset with similar tuberculous foci.

Kidneys.—Appeared to be normal.

Suprarenals.—Had whitish prominent spots in the cortex.

Stomach.—Normal.

Intestines.—The duodenum just beyond the pylorus showed several patches of congestion, but no ulceration.

The rest of the small intestine was normal.

The colon showed one or two minute ulcers, and contained numerous little worms ⅜ in. long.

Beneath the mucous membrane of the cæcum were several little shot-sized purple bodies, with purplish-brown contents. These were observed to be just beneath the little ulcers.

The glands between the cæcum and end of the ileum were perhaps a little enlarged.

Another gland, close to the pylorus and duodenum, and embedded in the pancreas, was slightly enlarged. Both contained tubercle bacilli.

Lungs.—Were fairly healthy, and contained a few minute tubercles only. The amount of lung disease was so slight that it was difficult to believe that any part of the injection had been intravenous.

Bronchial Glands.—Were slightly enlarged, and showed small white tubercles in the cortex.

Pleura, Pericardium, Peritoneum, Omentum.—Normal.

Heart, Pancreas, Testes, Tongue, Palate, Larynx, Tonsils. Submaxillary Lymphatic Glands.—Normal in appearance.

Tubercle bacilli were, however, found in tonsils and submaxillary gland.

Coverslip Preparations.

Liver.—Tubercle bacilli numerous and long.

Bronchial Gland.—Tubercle bacilli numerous and long.

Lung.—Tubercle bacilli fairly numerous.

Spleen.—Tubercle bacilli numerous and long.

Kidney.—No tubercle bacilli.

Cæcal Gland.—Tubercle bacilli not numerous.

Gland near Pylorus (in head of pancreas).—Tubercle bacilli not numerous.

Submaxillary Lymphatic Glands. Tubercle bacilli rather numerous; in definite groups.

Tonsils.—Tubercle bacilli.

Guinea-pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from the spleen, one from the liver, and one from the kidney, died of tuberculosis.

MONKEY 22 (Monkey Passage Experiment).

Subcutaneous: Inoculation of emulsion of spleen of Monkey 18.

Dose: Not estimated.

Date: November 17th, 1902.

Died: December 30th, 1902. (43 days.)

Clinical Notes.

The animal was inoculated in the right leg. An ulcer formed at the seat of inoculation. This monkey lived longer than any one of the other four included in the series, but it soon became obviously ill, and died 43 days after the commencement of the experiment.

POST-MORTEM EXAMINATION.

Local lesion.—On the outer and hinder part of the right leg was an ulcer measuring $1\frac{1}{2}$ in. by 1 in. The leg was sharply flexed upon the thigh, and could not be extended.

A right inguinal gland was seen prominent and softened, but not ulcerated.

On removing the skin, immediately around the ulcer was a zone of massed tubercles, partly in the subcutaneous tissue and deeper layers of the skin, and partly in the deep fascia.

Along the internal saphenous vein was a chain of little tubercles in the deep fascia.

About the middle of the back of the leg, just above the upper limit of the ulcer, and deeply seated between the flexors of the knee (which in the monkey are inserted very low down the leg) was a caseous and softened mass about $\frac{1}{2}$ in. in diameter, probably the popliteal gland.

Right Inguinal Glands.—Formed a three-cornered mass ($1\frac{3}{8}$ in. by 1 in.), entirely caseous and softened. Further out was a small caseous gland.

Within the pelvis, and occupying about one-third of its basin, was a large ($\frac{1}{2}$ in. in diameter) softened caseous mass, flattened against the right pelvic bones, and extending from the brim to the sciatic notch.

Iliac and Lumbar Glands.—Formed a complete chain of small caseating nodules.

Liver.—Contained five or six little tubercles, round some of which were clusters of minute grey foci. Moreover, on close inspection the liver generally was found to be full of very minute grey foci.

Spleen.—Was scarcely at all enlarged, and contained numerous very minute tubercles.

Kidneys.—Were healthy.

Right Suprarenal.—Contained a little dark brownish red solid nodule.

Left Suprarenal.—Normal.

Pancreas.—Was healthy.

Mesocolic and Mesenteric Glands.—Were comparatively large, but not a trace of tubercle could be seen in the former, while in the latter some very minute whitish points were seen.

In a gland in the gastro-hepatic omentum, near the pylorus, two or three little tubercles were seen.

Cervical Glands.—Were normal, and none were seen behind the sternum.

Lungs. The little right middle lobe and a small portion of the left were collapsed, and the former contained three very small tubercles.

Bronchial Glands.—The several bronchial glands appeared to be perfectly normal.

Pleura, Pericardium.—Were not affected.

Heart.—Was soft and flabby, but showed no tubercles.

Brain.—The surface of the left frontal lobe was congested. Otherwise the brain was normal.

No excess of cerebro-spinal fluid.

Blood.—The most remarkable change was in the blood, which at once on opening a vessel was seen to be thin and watery. That taken from the heart looked as if it had been greatly diluted. It clotted quickly, forming a firm pinkish red clot.

The corpuscles were normal in shape, and ran quickly together into rouleaux.

Microscopical Examination.

Caseous Matter from Popliteal Gland.—Tubercle bacilli numerous.

Mesenteric Gland containing Minute White Specks (crushed).—Tubercle bacilli in moderate numbers.

Cerebro-Spinal Fluid *Mesocolic Gland*	No tubercle bacilli.
Spleen (crushed tubercle) *Liver* (crushed tubercle)	Tubercle bacilli; not very numerous.

CALF 52 (Monkey Passage Experiment).

Subcutaneous: Inoculation of emulsion of spleen of Monkey 2.

Dose: Not estimated

Date: October 22nd, 1902.

Killed: November 23rd, 1902. (32 days.)

Clinical Notes.

Three weeks after inoculation there was a very large swelling at the seat of inoculation, and the calf was obviously ill.

It suffered from fits, and therefore was killed, although it would apparently have lived some time longer had it been allowed to do so.

POST-MORTEM EXAMINATION.

There was a large hard tumour at the seat of inoculation.

Left Precrural Gland, Left Iliac Gland, Both Sacro-Iliac Glands.—Were affected and crowded with small tubercles in the cortex.

Liver.—Contained a few little whitish tubercles.

Kidneys.—Contained three or four tubercles each and appeared fatty.

Spleen.—Appeared quite normal. A few little white spherical masses as large as small shot were found.

Lungs.—Contained considerable numbers of small pearl-like tubercles.

Bronchial Glands, Mediastinal Glands.—Tubercles in cortex.

Microscopic Examination.

Tubercle bacilli were found in crushed specimens of the following organs and glands:—

Precrural Glands, Sacro-Iliac Glands, Iliac Glands, Bronchial Glands, Post-Mediastinal Glands, Liver, Spleen.

None were found in the lung, and the kidney was doubtful.

Guinea-pigs Inoculated.

Four guinea-pigs, inoculated subcutaneously with emulsions made from the precrural gland, the spleen, liver and lung respectively, died of general tuberculosis in periods varying from 49 to 116 days.

CALF 48 (Monkey Passage Experiment).

Subcutaneous: Inoculation of emulsion of spleen of Monkey 18.

Dose: Not estimated.

Date: November 17th, 1902.

Killed: May 21st, 1903. (185 days.)

Clinical Notes.

The animal was under experiment for a period of six months, and during that time was not seriously ill. It gained in weight.

It was tested with tuberculin a week before being killed and gave a positive reaction.

Weights.

	cwt.	qrs.	lbs.
December 29th, 1902	2	2	4
March 31st, 1903	3	1	12

It is of interest to mention that the animal for a period of six weeks had been in the habit of licking the local ulcer that had formed at the seat of inoculation. A slough separated from this ulcer about two months after inoculation, and from then till the end of February there was an abundant discharge of sero-pus and subsequently caseopus. The sero-pus on microscopical examination was found to contain large numbers of tubercle bacilli.

POST-MORTEM EXAMINATION.

General Condition.—Fair.

Local Lesion.—At the seat of inoculation in the region of the left flank there was a dry ulcer about half an inch in diameter. In this position the skin was adherent to a subcutaneous thickening about 5 in. by 2½ in.

On section the subcutaneous lesion was found to be composed mainly of fibroid muscular tissue beset with yellow caseous tubercles. The lesion also contained a cavity about as large as a hazelnut, containing thick yellow caseo-pus. The tubercles were appreciably calcified.

Left Precrural Gland.—Was enlarged, measuring 3 in. by 1½ in. It was almost entirely caseous, and at some points gritty from calcification. It was surrounded by a firm fibrous capsule.

Running from one extremity of the gland there were some cord-like prolongations (thickened lymphatics) with fibrous walls and caseous contents.

Lungs.—The lungs contained numerous tubercles scattered pretty uniformly throughout the parenchyma; their total number must have been some hundreds, varying in size from a small pea to a barley grain. All of them were yellow from caseation.

Weight of Lung.—10 lbs. 7 oz.

Posterior Mediastinal Gland.—Enlarged (4 in. by 1½ in.), and contained numerous yellow and slightly gritty tubercles.

Bronchial Glands.—Also enlarged and similarly affected.

Glands in Anterior part of Mediastinum.—Ditto.

Three ventral mediastinal glands contained yellow and calcareous tubercles.

Heart and Pericardium.—Normal.

Pleura.—On the anterior surface of the diaphragm, were some fine pink villous looking growths, and on the abdominal surface of the central tendon on the right side of the body there was a tuberculous nodule half an inch in diameter, and about three sixteenths of an inch in thickness.

Alimentary Tract.

Tonsils, Tongue, Palate and Oesophagus.—Normal.

A lymphatic gland on the left side of the pharynx contained one small yellow tubercle smaller than a barley grain.

The opposite gland contained centrally, a cavity larger than a hazel-nut, containing thick yellow caseo-pus.

Small Intestine.—The duodenum was normal. Towards the lower end of the jejunum two Peyer's patches were seen, with two or three minute yellow points similar to those seen in the ileum; also in the mucous membrane of the jejunum were seen two slightly projecting tubercles, the size of a pin's head, with yellow caseous centres.

In the substance of the long Peyer's patch in the ileum were very numerous, just visible, discrete yellow points, and about half a dozen tubercles (the size of a No. 4 shot), which projected slightly from the surface of the patch, and which on section were yellow and caseous in the centre, but not calcareous.

More than half the mesenteric glands contained caseous and partly calcified nodules, some half an inch in diameter.

Cæcum, Colon and Rectum.—Normal.

Colic, Rectal Glands and Gastric Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen contained at least a dozen tubercles, yellow from caseation, slightly gritty from calcification, and mostly about the size of barley grains.

Weight of Spleen.—1 lb. 6 oz.

Liver.—On the surface of the liver were a number of grey tubercles from half an inch to a quarter of an inch in diameter, projecting from the peritoneal surface, with slightly overhanging edges. In the substance of the liver was a series of similar tuberculous nodules, caseating and slightly calcareous in the centre. These tubercles appeared to be in all stages of formation and degeneration. Three hepatic lymphatic glands contained numerous caseo-calcareous tubercles about the size of a small pea.

Weight of Liver.—8 lbs. 4 oz.

Kidneys, Right.—Immediately beneath the capsule of the right kidney there was one yellow tubercle about half the size of a barley grain.

Left.—Normal.

Uterus, Fallopian Tubes, Ovaries.—Normal.

Various Lymphatic Glands.

Right Submaxillary, Two Left Submaxillary, Three Small Lymphatic Glands from Middle of Neck.—Normal.

Right Prepectoral.—Normal.

Left Prepectoral.—Contained one caseous gritty tubercle the size of a barley grain.

Left Prescapular.—Contained a similar, but somewhat larger tubercle.

Right Prescapular.—Normal.

Axillary, Right and Left, Popliteal, Right and Left, Gluteal, Right and Left, Ischial, Right and Left, Right Iliac.—Normal.

The glands (two) along the left iliac artery were distinctly enlarged, tuberculous nodules throughout, caseous and calcareous, but remaining discrete.

Right Lumbar.—Contained several nodules in the cortex, caseous, varying in size from a pea to a millet-seed.

Left Lumbar.—Measured 1½ in. by 1 in. by ¾ in. On section found to be in a similar condition to the right lumbar; well marked calcification in cortex; only about half the gland implicated.

Right Suprammamary.—Normal.

Left Supramammary.—A little enlarged (compared with that on the right), and contained numerous yellow caseous and partly calcified tubercles.

Microscopical Examination (Smears).

Precrural Gland.—Tubercle bacilli.

Mesenteric Gland.—Tubercle bacilli.

Left Lumbar Gland.—Tubercle bacilli.

Left Prepectoral Gland.—Tubercle bacilli.

Intestine.—Tubercle bacilli.

Right Kidney.—No tubercle bacilli.

Guinea-Pigs Inoculated.

Three guinea-pigs were inoculated from the left precrural gland, and one each from the spleen and a mesenteric gland; all died of general tuberculosis.

VIRUS B II.

May 16, 1902.

LUNG AND THORACIC GLANDS.

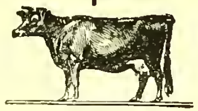
Cow with tuberculosis of the lungs and thoracic glands; the glands were large and caseo-calcareous.

TABLE 2a.

VIRUS B. II.

(May 17th, 1902.)

BOVINE GLAND (MEDIASTINAL).



COW 500.

Intramammary.

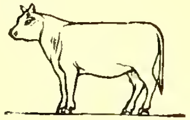
Killed, June 18th, 1902
(32 days).

P.M.—Tuberculosis of inoculated quarters, supramammary and iliac lymphatic glands.

No guinea-pigs inoculated except with the milk.

GUINEA-PIGS.

43	Died	69 days	G.T.	S.
44	"	62 "	T.	S.
45	"	59 "	G.T.	S.
46	"	19 "	T.	I.
47	"	64 "	G.T.	S.
49	"	15 "	T.	I.



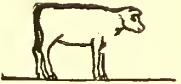
HEIFER 16.

Subcutaneous.

Killed, July 4th, 1902
(48 days).

P.M.—Large local tumours; adjacent glands tuberculous; lungs and thoracic glands extensively, spleen, liver, mesenteric and rectal glands slightly, tuberculous.

No guinea-pigs inoculated.



CALF 50. Sucking.

Fed for 41 days with tuberculous milk (suckled by Cow 500 for 31 days and by Cow 18 (Table 1b) for 10 days).
Killed, October 16th, 1902
(151 days).

P.M.—Extensive disease of the alimentary tract; mesenteric glands enlarged, caseous, and calcareous; tubercles in the liver, spleen, and lungs.

GUINEA-PIGS.

Liver	200	Died.	76 days.	G.T.	S.
	201	"	25 "	G.T.	I.
Spleen	202	"	76 "	G.T.	S.
	203	"	26 "	G.T.	I.

TABLE 2c.

Culture Inoculations.

VIRUS B. II.

(May 17th, 1902.)

LUNG.

Inoculated on September 30th, 1904, with culture derived from Heifer 66 (*see* Table 2b).

The sub-culture used was 20 days old, 9th generation ; the total age of the culture was 357 days.

RABBITS.

Number.	Dose.	Method.	Duration of life.	Result.
121	0·1 mg.	Intrav.	D. 22 days	G.T.
122	0·1 mg.	„	D. 25 „	G.T.
120	1·0 mg.	Intrap.	D. 18 „	G.T.
123	0·1 mg.	Subcut.	D. 137 „	G.T.
124	0·1 mg.	„	D. 67 „	G.T.
125	1·0 mg.	„ partly Intrap.	D. 25 „	G.T.

CALF 212.

Subcutaneous.

Dose : 50 mg.

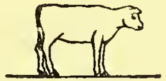
Died, October 25, 1904.

(25 days).

Intermuscular local lesion ; acute miliary tuberculosis.

Inoculated on November 28, 1904, with culture derived from the local lesion of Calf 134 (*see* Table 2b).

The subculture used was 20 days old, 5th generation ; the total age of the culture was 227 days.



CALF 226.

Subcutaneous.

Dose : 50 mg.

Killed, December 23, 1904.

(25 days).

General Tuberculosis.

RABBITS.

Number.	Dose.	Method.	Duration of life.	Result.
150	0.1 mg.	Intrav.	D. 19 days	G.T.
151	0·1 mg.	„	D. 26 „	G.T.
152	1·0 mg.	„	D. 15½ „	G.T.
148	1·0 mg.	Intrap.	D. 17 „	G.T.
149	1·0 mg.	„	D. 16 „	G.T.
146	1·0 mg.	Subcut.	D. 81 „	G.T.
147	1·0 mg.	„	D. 91 „	G.T.

TABLE 2B.

VIRUS B. II.

(May 17th, 1902.)

BOVINE LUNG.

GUINEA PIGS.

38	Died -	60 days	G.T.	S.
39	Killed -	61 ,,	G.T.	S.
40	Died -	13 ,,	T.	I.
41	,, -	14 ,,	T.	I.
42	,, -	14 ,,	T.	I.

COW 4. Intramammary.

Killed, June 20, 1902.
[34 Days.]

P.M.—Tuberculosis of inoculated quarters, supramammary and iliac lymphatic glands ; early tuberculosis of the lung and bronchial glands.

No Guinea-pigs inoculated except from the milk.

CALF 22. Sucking.

Fed for 33 days.
Killed, May 16, 1903.
[365 Days.]

P.M.—Tuberculosis of alimentary tract and mesenteric lymphatic glands ; two nodules in liver ; a few tubercles in thoracic glands.

HEIFER 14.

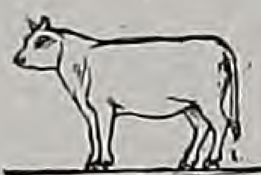
Subcutaneous.
Killed, June 21, 1902.
[35 Days.]

P.M.—At both seats of inoculation large local lesions ; adjoining glands large and caseous ; miliary tuberculosis.

GUINEA-PIGS.

114	Died -	51 days	T.	S
115	, -	29 ,,	G.T.	I.
116	,, -	21 ,,	G.T.	I.

MESENTERIC GLANDS.



SHORTHORN HEIFER 100.

Subcutaneous.
Dose : 1,330 T.B.
Killed, September 15, 1903.
[122 Days.]

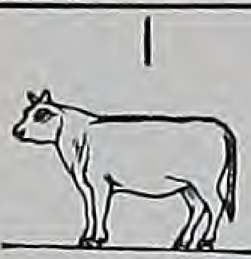
P.M.—Calcareous local lesion and prescapular gland (only half affected); tuberculosis of pleura and diaphragm ; calcareous tubercles in spleen, liver, kidneys, lungs and thoracic glands.

GUINEA-PIGS.

Prescapular gland.	572	Died	39 days	G.T.	S.
	573	,,	31 ,,	G.T.	S
	574	,,	27 ,,	T.	I.
	575	,,	26 ,,	T.	I.
Liver.	576	Killed	66 ,,	No.T.	S.

GUINEA-PIGS

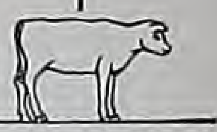
Dose = 133 T.B.	393	Died	73 days	G.T.	S.
	394	,,	57 ,,	G.T.	I.
	395	,,	67 ,,	G.T.	S.



JERSEY HEIFER 66.

Subcutaneous.
Dose : 1,330 T.B.
Killed, October 10, 1903.
[148 Days.]

P.M.—Caseous and calcareous local lesion and prescapular gland ; a few tubercles in liver, spleen, lungs and thoracic glands.



CALF 114.

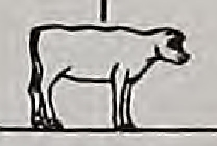
[Age, 10 weeks.]
Subcutaneous.
Dose : 1,330 T.B
Killed, October 23, 1903.
[161 Days.]

P.M.—Small intermuscular local lesion. One left anterior mediastinal gland tuberculous throughout. A few tubercles in left prescapular and prepectoral glands. Slight tuberculosis of spleen, liver and lungs.

GUINEA-PIGS.

Left Anterior Mediastinal Gland.	651	Died	52 days	G.T.	S.
	653	Killed	61 ,,	G.T.	S.
	654	Died	14 ,,	T.P.	I

PRESCAPULAR GLAND.



CALF 134.

Subcutaneous.
Dose : 205,326 T.B.
Killed, April 15th, 1904
(188 days).
P.M.—Local lesion only.

GUINEA-PIGS.

Pus from local tumour	937	Killed	33 days -	G. T.	I.
	938	,, -	,, -	G. T.	S'
	939	,,	,, -	G. T.	S.
Prescapular gland	940	Died -	54 ,, -	G T.	S.
	941	,, -	58 ,, -	G. T.	I.

E. of organs of G.P.s 938 and 939.

G.P. 938	996	Killed -	14 days -	G. T.	I.
	997	,, -	14 ,, -	G. T.	I
G.P. 939	998	,, -	14 ,, -	G. T.	I'
	999	,, -	14 ,, -	G. T.	I.

E. of organs of G.P.s 996 to 999.

GUINEA-PIGS.

Dose = 9,333 T.B.	634	Died	88 days	G.T.	S.
	635	,,	71 ,,	G. T.	S.
	636	,,	18 ,,	S. T.	I.
	637	,	40 ,,	G.T.	I.

CALF 136.

Intraperitoneal.
Dose : 205,326 T.B'
Killed, April 15, 1904
(188 days).

P.M.—Tuberculosis of peritoneum , gastric cœliac and pancreatic glands affected, also the long mediastinal and two ventral mediastinal glands ; no organs affected.

GUINEA-PIGS.

Mediastinai gland	942	Died -	47 days-	G.T.	S
	943	,, -	42 ,, -	G.T.	I.
Spleen	944	Killed	67 ,, -	No.T.	S.
Peritoneal nodule	945	Died -	67 ,,	G.T.	S.
Pancreatic gland	946	,,	13 ,,	No.T.	S.

Inoculated | June 2, 1904.

Emulsion contained 235,740,000 T.B. per cc.

GOAT 6.

(Adult).

: 5,000 T.B. in 1 c.c of a 1 in 47,000 dilution of the emulsion.

GOAT 10.

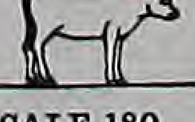
(Adult).

Dose : 4,480,000 T.B. in 1·9 c.c. of a 1 in 100 dilution of the emulsion.

Dose : 5,000 T.B.	1025	Died	47 days	G.T.	S.
	1026	,,	47 ,,	G.T.	I.

CALF 158.

CALF 178



CALF 180.

CALF 160.

Age : 8 months

Dose=133	394	,,	57 ,,	G.T.	I.
	395	,,	67 ,,	G.T.	S.

SHORTHORN HEIFER 100.

Subcutaneous.
Dose : 1,330 T.B.
Killed, September 15, 1903.
[122 Days.]

P.M.—Calcareous local lesion and prescapular gland (only half affected); tuberculosis of pleura and diaphragm ; calcareous tubercles in spleen, liver, kidneys, lungs and thoracic glands.

GUINEA-PIGS.

Prescapular gland.	572	Died	39 days	G.T.	S.
	573	,,	31 ,,	G.T.	S
	574	,,	27 ,,	T.	I.
	575	,,	26 ,,	T.	I.
Liver.	576	Killed	66 ,,	No.T.	S.

JERSEY HEIFER 66.

Subcutaneous.
Dose : 1,330 T.B.
Killed, October 10, 1903.
[148 Days.]

P.M.—Caseous and calcareous local lesion and prescapular gland ; a few tubercles in liver, spleen, lungs and thoracic glands.

CALF 114.

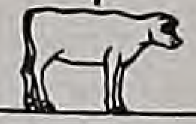
[Age, 10 weeks.]
Subcutaneous.
Dose : 1,330 T.B
Killed, October 23, 1903.
[161 Days.]

P.M.—Small intermuscular local lesion. One left anterior mediastinal gland tuberculous throughout. A few tubercles in left prescapular and prepectoral glands. Slight tuberculosis of spleen, liver and lungs.

GUINEA-PIGS.

Left Anterior Mediastinal Gland.	651	Died	52 days	G.T.	S.
	653	Killed	61 ,,	G.T.	S.
	654	Died	14 ,,	T.P.	I

PRESCAPULAR GLAND.



CALF 134.

Subcutaneous.
Dose : 205,326 T.B.
Killed, April 15th, 1904
(188 days).
P.M.—Local lesion only.

GUINEA-PIGS.

Pus from local tumour	937	Killed	33 days -	G. T.	I.
	938	,, -	,, -	G. T.	S'
	939	,,	,, -	G. T.	S.
Prescapular gland	940	Died -	54 ,, -	G T.	S.
	941	,, -	58 ,, -	G. T.	I.

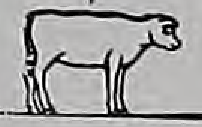
E. of organs of G.P.s 938 and 939.

G.P. 938	996	Killed -	14 days -	G. T.	I.
	997	,, -	14 ,, -	G. T.	I
G.P. 939	998	,, -	14 ,, -	G. T.	I'
	999	,, -	14 ,, -	G. T.	I.

E. of organs of G.P.s 996 to 999.

GUINEA-PIGS.

Dose = 9,333 T.B.	634	Died	88 days	G.T.	S.
	635	,,	71 ,,	G. T.	S.
	636	,,	18 ,,	S. T.	I.
	637	,	40 ,,	G.T.	I.



CALF 136.

Intraperitoneal.
Dose : 205,326 T.B'
Killed, April 15, 1904
(188 days).

P.M.—Tuberculosis of peritoneum , gastric cœliac and pancreatic glands affected, also the long mediastinal and two ventral mediastinal glands ; no organs affected.

GUINEA-PIGS.

Mediastinai gland	942	Died -	47 days-	G.T.	S
	943	,, -	42 ,, -	G.T.	I.
Spleen	944	Killed	67 ,, -	No.T.	S.
Peritoneal nodule	945	Died -	67 ,,	G.T.	S.
Pancreatic gland	946	,,	13 ,,	No.T.	S.

Inoculated June 2, 1904.

Emulsion contained 235,740,000 T.B. per cc.

GOAT 6.

(Adult).

Dose : 5,000 T.B. in 1 c.c of a 1 in 47,000 dilution of the emulsion.
Killed November 10th, 1904 (161 days).

P.M.—Group of nodules at seat of inoculation : prescapular gland caseous throughout : 2 nodules in the spleen, a few in the liver, and 24 in the lungs. Intestines, mesenteric and thoracic glands affected.

Prescapular gland.

1338	Died -	31 days	T.	S.
1339	,,	39 ,,	T.	I.

GOAT 10.

(Adult).

Dose : 4,480,000 T.B. in 1·9 c.c. of a 1 in 100 dilution of the emulsion.
Killed, November 14, 1904 (165 days).

P.M.—Large group of nodules at seat of inoculation ; prescapular gland caseous throughout ; there were 9 nodules in the spleen and several in the liver ; lungs severely affected ; thoracic, portal, cœliac, mesenteric, and pharyngeal glands were tuberculous; intestines contained numerous tuberculous ulcers.

G.P.s from prescapular gland.

1345	Died	74 days-	G. T	S.
1346	,,	58 ,, -	G. T	I.

Dose: 5,000 T.B.	1025	Died	47 days	G.T.	S.
	1026	,,	47 ,,	G.T.	I.
Dose : 4,480,000 T.B.	1027	,,	57 ,,	G.T.	S.
	1028	,,	22 ,,	G.T.	I.

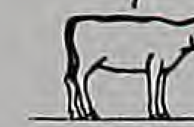
CALF 158.

Age : 10 months.
Dose : 5,000 T.B. in 1 cc. of a 1 in 47,000 dilution of the emulsion.
Killed, October 21, 1904 (141 days).

P.M.—Small local lesion ; prescapular gland contained 2 caseo-calcareous masses, one tubercle in a dorsal mediastinal gland.

G.P.s from prescapular gland.

1317	Died -	86 days -	G.T.	S.
1318	, -	47 ,,	G.T.	I.



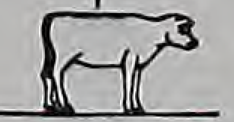
CALF 178

Age : 5 months.
Dose : 200,000 T.B. in 8·5 cc. of a 1 in 10,000 dilution of the emulsion.
Killed, November 2, 1904 (153 days).

P.M.—Local lesion, great enlargement, fibrosis and necrosis of prescapular, prepectoral, thoracic and portal glands and caseous nodules in all organs (except kidneys).

G.P. from spleen.

1325	Died -	53 days -	G.T.	S.



CALF 180.

Age : 5 months.
Dose : 4,480,000 T.B. in 1·9 cc. of 1 in 100 dilution of the emulsion.
Killed, November 4, 1904 (155 days).

P.M.—Local abscess ; neighbouring glands tuberculous ; large caseous nodules in spleen, liver and lungs ; thoracic and portal glands affected.

G.P. from liver.

1326	Died -	76 days -	G.T.	S.

CALF 160.

Age : 8 months.
Dose : 542,202,000 T.B. in 2·3 cc. of the undiluted emulsion.
Killed November 19, 1904 (160 days).

P.M.—Ulcerated fibroid lesion ; neighbouring glands caseous ; numerous nodules in spleen, liver, and lungs ; a few in each kidney ; thoracic, portal, and cœliac glands tuberculous ; tuberculosis of pleura and peritoneum.

GUINEA-PIGS.

Kidney	1336	Died	47 days	G.T.	S.&I.
Prescapular gland	1337	,,	130	G.T.	I.

HEIFER 16.

Subcutaneous inoculation of an emulsion made from the original material of Virus B II.

Dose—20 cc. (Number of tubercle bacilli not estimated.) 10 cc. on left side of neck and 10 cc. in left groin.

Date—May 17th, 1902.

Killed—July 4th, 1902. 48 days after inoculation.

Clinical History.

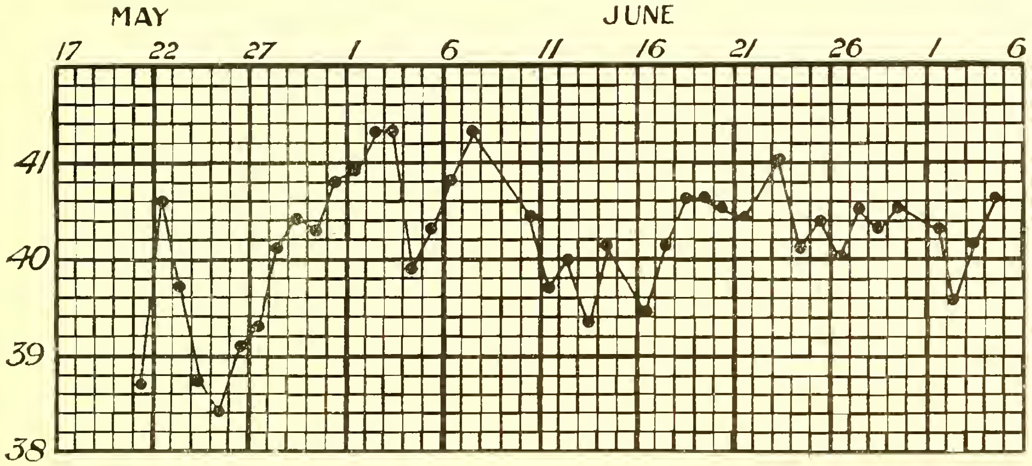
The heifer was inoculated subcutaneously in front of the left shoulder and in the left flank on May 19th, 1902. At each seat of inoculation seven days later there was a small swelling and the adjacent glands were enlarged. Both swellings slowly increased in size and became very large and prominent; the anterior swelling interfered very much with the movement of the head; on July 3rd a small ulcer discharging serous fluid appeared on the posterior swelling; around both tumours there was some œdema.

The heifer became thin and suffered from high fever; she was not, however, so severely affected as Heifer 14 and walked out to be photographed on the day she was killed.

She was killed because the tumours gave her considerable discomfort, the anterior one interfering very much with the movements of her head.

The post-mortem examination showed general progressive tuberculosis, and there can be no doubt that she would soon have succumbed to the disease.

Temperature.



POST-MORTEM EXAMINATION.

Local Lesions.—At the posterior seat of inoculation there was a large tumour, extending upwards and becoming continuous with the precrural gland; the skin below was adherent, cracked, and ulcerated, discharging a clear serum.

There was much œdema around.

On section the tumour was continuous with the adjacent muscles, which were infiltrated with isolated yellow patches. It was firmly adherent to skin and continuous above with the precrural gland.

The tumour and gland weighed 5 lbs. 11½ ozs.

The tumour without gland measured 7 in. by 5 in., and the gland alone measured 5¼ in. by 2¼ in.

The tumour was firm and on section composed of irregular yellow patches of various sizes, surrounded either by muscle or by a network of dense white fibrous tissue. It contained a large cavity, nearly as large as one's fist, full of clear serum, and lined with a soft, thick, irregular vegetation of pinkish fibrinous lymph.

The precrural gland on section was firm, of a uniform pinkish yellow colour, its lower parts and its upper two-thirds was thickly infiltrated with yellow patches and studded with small hæmorrhages. The lower pinkish portion was surrounded by a yellowish cortex ⅛ in. thick, which easily peeled off, leaving a pitted surface. The right precrural gland was normal.

The anterior seat of inoculation was occupied by a very large tumour adherent to skin, but not ulcerated. The surrounding tissues were extremely œdematous. The neighbouring muscle close to the tumour contained numerous yellow nodules as large as No. 5 shot.

The tumour when separated as much as possible from the surrounding parts weighed 5 lbs. 4 ozs. and measured 9 in. by 4 in. by 5½ in. On section the tumour was found to contain the prescapular gland, which resembled those described above. The rest of the tumour was made up of irregular foci embedded partly in indurated muscle and partly in dense white fibrous tissue. In structure it exactly resembled the posterior swelling.

Two Prepectoral Glands.—Each as large as a golf ball, indurated and mottled pink and yellow, on section were found near the middle line at the root of the neck, superficial to the deep fascia.

Two Axillary Glands were seen smaller than the above, but similar on section.

Thorax:

The Pleura.—Along both borders of ribs were fringes of soft pink velvety vegetations, and along the right edge of the vertebral columns were numerous irregular patches (up to ½ in. in diameter) of dark red velvety vegetations, some of them containing one or more tubercles. The diaphragmatic surface was studded with similar patches of velvety vegetations.

There was a good deal of pleural fluid, perhaps one pint, but it was not measured.

The Lungs.—Were covered all over with numerous hemispherical projections up to the size of a pea, particularly numerous about the anterior and inferior portions (*i.e.*, near the first rib and near the heart). On section these were seen to be yellowish tubercle, and the same could be seen throughout the lung substance.

There were a few lobules of dark colour and depressed surface (? collapse.) No interstitial emphysema.

The Bronchial and Mediastinal Glands.—Showed numerous tuberculous nodules and foci, up to ¾ in. in diameter; one bronchial gland measured 2½ in. by 1½ in.

The long dorsal mediastinal gland measured 6½ in. by 1½ in.

Heart.—Normal.

Abdomen:

Peritoneum, Omentum and *Mesentery.*—Showed no sign of tubercle.

Mesenteric Glands.—Contained indurated patches of paler tissue containing numerous minute whitish grains. In a cover-slip preparation made from an emulsion of one of the patches numerous tubercle bacilli were found.

Rectal Lymphatic Glands.—Were similar in appearance and a cover-slip preparation from an emulsion showed tubercle bacilli.

Spleen.—Normal in size and appearance. On section contained a few scattered tubercles of the size of a No. 1 shot.

Liver.—Normal in size. Showed scattered yellowish tubercles projecting from the surface, very variable in size. No tubercle bacilli found in emulsion of one of these.

Portal Gland.—Was enlarged and nodular from tubercles of various sizes situated in its cortex.

Kidneys.—Normal in appearance and size. On section the left was normal. The right showed a few patches of cortical congestion (the animal was lying on its right side at time of death), and one single (?) tubercle just under the capsule. No tubercle bacilli found in emulsion made from this.

Suprarenal Bodies.—Normal.

Left Iliac Gland.—Much enlarged, measured 5½ in. by 3 in. and weighed 9½ oz. On section about half was occupied by an indurated mass, in parts pink and in parts yellow, exactly resembling the affected glands already described; but surrounding this dense portion and divided from it by a sharp line of demarcation, was soft glandular tissue containing a few scattered yellow tubercles.

Further out between the left anterior superior spine of ilium and the front of the thigh was another hard gland as large as a bantam's egg. On section this resembled those already described.

The Right Iliac Glands.—Did not appear to be affected. Several small glands between the rectum and sacrum contained portions of paler denser tissue (up to ⅓ in. in diameter) studded with yellow foci. Tubercle bacilli found in emulsion.

Lumbar Glands.—Several were enlarged and contained yellow foci.

The Pelvic and Lumbar Lymphatics.—Were diseased.

Pancreas.—Normal.

Ovaries and Bladder.—Normal.

Uterus.—Showed a single subperitoneal tubercle. (No tubercle bacilli found in it.) Interior, normal.

Thyroid, Thymus, Pharynx, and Tonsils.—Normal.

Pharyngeal Lymphatic Glands (?) were rather large; emulsion showed no tubercle bacilli.

Popliteal Glands.—Normal.

The Mammary Gland.—Was surrounded by an enormous amount of œdema. The right side showed nothing abnormal, but the left was much enlarged and firmer than normal. On section it was seen to be composed of yellowish nodules set in a loose connective tissue.

The Supramammary Glands.—Were fused together and sat like a saddle on the top of the mamma. The left was three times as large as the right; both together weighed 1 lb. 1½ ozs. On section they were pink and partly yellowish, and surrounded by a yellow capsule; the tissue was studded with small hæmorrhages; (like the precrural gland already described).

COW 500.

Intramammary inoculation of an emulsion made from the original material of Virus B II.

Dose—10 cc. into right hind quarter and 10 cc. into left fore quarter (Number of bacilli not estimated).

Date—May 17th, 1902.

Killed—June 18th, 1902, 32 days after inoculation.

Clinical History.

The cow had given birth to a calf on April 23rd (24 days before the commencement of the experiment.) The calf was separated from its mother immediately before the inoculation, and not allowed to suckle her again for 24 hours.

An emulsion made from the fresh material of a bovine gland (mediastinal) was injected into two of the quarters of the udder, the total quantity injected being 20 cc. No estimate of the number of tubercle bacilli contained in the emulsion was made.

Ten days after the inoculation enlargement of the infected quarters of the udder was noticed, and by the end of the first fortnight both were large and uniformly hard. The cow had become thinner, and was obviously ill. During the last week the animal was generally lying on its side, and could not be persuaded to get up.

Temperature.

During the first two weeks there was no alteration in the temperature. It afterwards rose, and remained above normal till the end of the experiment.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Mammary Gland.—Weight 16 kilos.

There was great disparity of size between the opposite quarters, the left fore and right hind being four times as large as their fellows. The right hind was considerably larger than the left fore. The surrounding connective tissue was œdematous.

In each of the inoculated quarters the milk sinus and large ducts opening into it contained stringy yellowish white fibrinous coagula. The mucous membrane of the sinuses and large ducts had a granular appearance and was congested; with the possible exception of a small piece of the superior part of the right hind quarter, the whole of the two inoculated quarters was profoundly abnormal. The gland tissue was abnormally firm, showed an abnormally distinct lobulation, and was in some parts deeply congested, especially towards the base of the quarter. The density diminished from the base of the teat upwards.

Supramammary Lymphatic Glands.—Both were enormously enlarged and together as large as an ox kidney. They were everywhere beset with caseating points.

The greater part of the non-inoculated quarters was normal, and on each side there was a sharp line of demarcation between the healthy and the diseased tissue, towards the place where the fore and hind quarters merge into each other.

External Iliac Glands.—On both sides were enlarged to about four times the normal, and the cortices were thickly beset with miliary tubercles.

Mesenteric and Other Abdominal Lymphatic Glands.—Normal.

Lumbar Glands.—Normal.

Spleen, Liver, Kidneys.—Normal.

Thorax:

Dorsal Mediastinal Glands.—Normal.

Bronchial Glands.—Normal.

Lungs.—In both there was extensive interlobular emphysema throughout the whole lung tissue; otherwise normal.

A little frothy mucus in bronchi.

Precrural and Popliteal Glands.—Normal.

Prescapular Glands.—Normal.

Tongue, Throat and Pharyngeal Lymphatic Glands.—Normal.

Heart and Pericardium, Pleura and Peritoneum.—Normal.

CALF 50.

Feeding experiment—Fed with tuberculous milk of Cow 500 for 31 days and with that of Cow 18 for 10 days.

Age—3½ weeks.

Killed—October 16th, 1902, 150 days after the experiment began.

ABSTRACT OF POST-MORTEM NOTES.

The post-mortem examination showed extensive tuberculosis of the digestive tract. The small intestine was riddled with ulcers, which in places were more or less confluent for several inches together. On the peritoneal surfaces of some of the intestinal ulcers were little pedunculated or sessile tubercles; the tonsils and nasal septum were tuberculous. The lymphatic glands connected with the alimentary canal were greatly enlarged and caseo-calcareous throughout. There were numerous pea-sized nodules in the liver, about two dozen in the lungs and a few (8 to 12) in the spleen.

Note.—The full notes on this animal are given in "Feeding experiments with the bovine tubercle bacillus" page 673.

GUINEA-PIGS INOCULATED WITH MILK OF COW 500.

Doses : Each pair of Guinea-pigs was inoculated with the centrifugalised deposit of 30 c.c. of milk.

Date of Inoculation.	No. of Guinea-pig and Quarter of Udder.	Weight. in Grammes.	Length of Life in days.		Killed or Died.	Result.
			Intrap.	Subcut.		
May 17, 1902 (Before inoculation).	25 RF. quarter.	360		154	K	H.
	26	305	154		K	H.
	27 LF. ,,	360		185	K	H.
	28	365	154		K	H.
	29 RH.	300		137	K	H.
	30	285	75		D	G.T.*
	31 LH. ,	530		137	K	H.
	32	405	185		K	H.
June 3, 1902 (17 days after the inoculation of the Cow).	73 RF. ,,	450		146	K	G.T.
	74	570	122		D	G.T.
	75 LH. ,,	550		146	K	G.T.
	76	460	104		D	G.T
	77 LF. ,,	550		84	D	G.T.
	78	300	20		D	G.T.
	79 RH. ,,	330		52	D	G.T.
	80	570	34		D	G.T.
June 17, 1902. (31 days after inoculation)	97 RF. ,,	320		133	K	G.T.
	98	340	109		D	G.T.
	99 LH. ,,	310		118	D	G.T.
	100	270	63		D	G.T.
	101 LF. ,,	250		78	D	G.T.
	102	350	46		D	G.T.
	103 RH. ,,	260		20	D	S.T.
	104	300	48		D	G.T.

* The distribution of the lesions found on post-mortem examination of Guinea-pig 30 suggested alimentary infection.

HEIFER 14.

Subcutaneous inoculation of an emulsion made from the original material of Virus B II.

Dose—20 cc. 10 cc. in front of left shoulder and 10 cc. in left groin. (Number of tubercle bacilli not estimated.)

Date—May 17th, 1902.

Killed—When gravely ill, June 21st, 1902. 35 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck and in the left groin on May 17th, 1902. Four days later at each seat of inoculation there was a swelling about the size of a hen's egg.

On May 24th, 7 days after inoculation, the anterior tumour was diffuse, tender, and as large as one's outspread hand; the posterior tumour was hard and localised and not particularly tender.

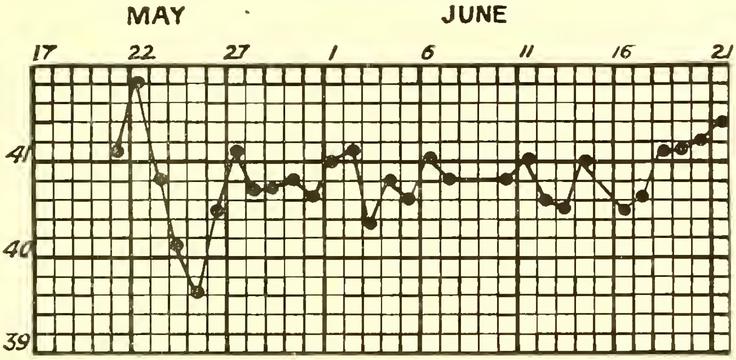
Both swellings became very much larger and there was marked œdema of the dewlap, extending from the anterior swelling, and of the abdominal wall extending from the posterior swelling; on June 6th, 1902, the latter ulcerated, discharging serous fluid. The prescapular and precrural glands became much enlarged.

Signs of ill-health were first noticed on May 28th, 11 days after inoculation; the heifer was quieter and showed, after lying down, a great disinclination to get up.

Acute illness rapidly supervened and she became very thin and emaciated.

The temperature was high four days after inoculation and remained continuously high during the remainder of the experiment.

Temperature.



POST-MORTEM EXAMINATION.

The Posterior Seat of Inoculation.—Was occupied by a large mass of caseous tubercle breaking down near the skin. The mass measured 3¼ in. by 2½ in. and was adherent to the skin which was infiltrated and showed an opening of ulceration about 1 in. in diameter. In the front of the mass the greatly enlarged precrural gland, 4 in. by 2 in., was uniformly infiltrated by caseous tubercle, Between the precrural gland and the local lesion were several masses of caseous tubercle, the largest 1 in. in diameter. The mass at the seat of inoculation and the gland were united by greatly thickened and œdematous connective tissue.

The Anterior Seat of Inoculation.—Was occupied by a large flattened mass about 12 in. in diameter and 4 in. or more in thickness. On section the mass showed very numerous areas of caseating tubercle, the largest of which was 1 in. in diameter and the smallest about 1 mm. Between the caseous masses was greatly thickened white tough connective tissue; the tissue around the tumour was very œdematous.

The Left Prescapular Gland.—Was surrounded by the previously described caseous mass as well as by greatly thickened connective tissue. It was about three times the normal size, measuring about 3½ in. in length by 2 in. in breadth. Large areas of the gland were yellow and caseous; no individual tubercles were seen.

Left Axillary Gland.—Enlarged to three or four times normal size, in a condition of firm caseation.

Right Axillary Gland.—Normal.

Right Prescapular Gland.—Somewhat enlarged but no tubercles visible.

Thorax :

Pleura.—Both side of thorax showed lines of slight "grapy" bodies along the intercostal spaces, villous and pink in appearance.

Lungs.—The surface of the lungs was studded with innumerable projecting sub-pleural nodules 2 to 5 mm. in diameter; they were firm and yellowish in colour and were most numerous in the upper three-fourths. On section there was a similar condition in the substance; both lungs were alike; round a few of the nodules were a few dark areas of collapse and broncho-pneumonia.

The Bronchial Glands.—On both sides and the mediastinal glands were enlarged to three times the normal size, and the cortices of all of them were crammed with grey tubercles.

Pericardium and Heart.—Normal.

Abdomen :

Omentum.—Contained a few large masses about $\frac{1}{12}$ in. to ⅛ in. in size.

Spleen.—There were a few tubercles on capsule; on section fairly numerous discrete tubercles were seen, these were firm and yellowish in centre.

Liver.—Showed on surface and on section through the substance miliary tubercles, some white and some yellow, varying in size.

Gall Bladder.—Normal and contained a small quantity of greenish bile.

Kidneys.—Showed sparsely scattered tubercles of various sizes projecting through the cortex and also into the substance of the kidney.

Right Iliac Gland.—Normal in size but showed one or two doubtful points about the size of mustard seeds.

Left Iliac Gland.—Four times the normal size; cortex filled with tubercles.

Tongue, Larynx, and Pharynx.—Normal in appearance.

Mamma.—Normal.

Left Supramammary Gland.—Enlarged, yellow, and caseous.

Right Supramammary Gland.—Enlarged, at one part yellow and caseous. There was no thickening of the mammary gland which was elementary.

Popliteal Glands.—On both sides were normal.

Microscopical Examination (Smear Preparations).

Lung.—Tubercle bacilli.

Local Tumour (Anterior).—Tubercle bacilli.

Local Tumour (Posterior).—Tubercle bacilli.

Omentum.—Tubercle bacilli.

Right Prescapular Gland.—Tubercle bacilli.

Left Bronchial Gland.—Tubercle bacilli.

Right Supramammary Gland.—Tubercle bacilli.

Spleen.—Tubercle bacilli.

Guinea-pigs Inoculated.

Three guinea-pigs inoculated with emulsions made from the prescapular and precrural glands died of tuberculosis.

COW 4.

Intramammary inoculation of emulsion of bovine lung.

Dose—10 cc. into left fore quarter and 10 cc. into right hind quarter.

Date—May 17th, 1902.

Killed—June 20th, 1902. 34 days after inoculation.

Clinical History.

On the 13th of April, four days before the commencement of the experiment, the cow gave birth to a calf (No. 22). The calf was separated from its mother just before the inoculation, and allowed to suckle again twenty-four hours later.

The cow was inoculated on May 17th, an emulsion made from the fresh material of Virus B. II. (tuberculous bovine lung) being injected into two of the quarters of the udder. The total quantity injected was 20 c.c., but the number of tubercle bacilli contained in the emulsion was not estimated.

The taking of samples of milk from each quarter before the injection was by mistake omitted, but an hour and a half later the teats and udder were washed with a solution of Lysol (1·5 per cent.) followed by washing with sterilished water to remove all possible external contamination from the emulsion. Milk was then drawn from the non-inoculated quarters, the first quantity of the milk so drawn being rejected. The remainder of the milk was injected into guinea-pigs, two being inoculated subcutaneously and two into the peritoneal cavity. One of the guinea-pigs died at the end of 143 days, one was killed after 136 days and the other two were killed after 144 days. In none of the four was any tuberculosis found on post-mortem examination.

Ten days after the commencement of the experiment the injected quarters of the udder were definitely larger than the other but the general condition of the cow was not obviously altered. By the 24th day there was marked œdema of all four quarters of the udder, extending to the margin of the thorax, and both precrural glands were enlarged.

A few days before death the animal was very ill. On the morning of the 19th she was found lying down. The right horn was worn apparently from violent rubbing on the ground, and there was a bruise under the jaw. Later in the day an internal squint was noticed, the head was much retracted and from time to time there were convulsive movements of the legs. The cow was quite conscious and breathing deeply and easily. She was, however, obviously very ill, and was therefore killed.

Temperature.

The temperature remained normal for the first eight days after inoculation. It then rose and on the 13th and 14th days was 41.2. There was then a gradual and slight fall till the end of the experiment, with a sudden fall on the last two days to normal.

POST-MORTEM EXAMINATION.

There was much œdema around and in front of the mammary gland extending to the margin of the thorax. The œdema fluid was dark in colour (yellow) and that which ran out on to the dishes clotted.

Mammary Gland.—Weight, 14 kilos.

Non-Infected Quarters.—Of a pale cream colour, not obviously abnormal, but on close inspection the left hind quarter was firmer and more distinctly lobulated.

No tubercles or caseation observed.

Injected Quarters.—Enormously enlarged, solid and firm throughout, showed a mass of tuberculous granulation tissue commencing to caseate. Lobulation well marked. Milk sinuses filled with yellow coagula, their walls covered with tubercles.

Precrural Glands :

Right.—Enlarged, numerous tubercles. Contained an irregular cavity full of dark clot.

Left.—Enlarged, numerous tubercles.

Supramammary Glands :

Right.—Enlarged, full of tubercles, contained a cyst as large as a pigeon's egg full of soft pale clot and serum. Wall of the cyst covered with tubercles.

Left.—Enlarged (weight 370 g.), full of tubercles beginning to caseate.

External Iliac Glands.—Much enlarged. Whole of cortex tuberculous. (Right 220; Left 310 grammes.)

Uterus and Ovaries.—Normal.

Kidneys.—Left normal. Right normal except for a few small cysts.

Suprarenals.—Normal.

Spleen.—Normal.

Pancreas.—Normal.

Liver.—Normal.

Lungs.—Some interstitial emphysema with patches of collapse. General appearance on section fairly normal, but some of the lobules were marked with a pale mottling. Left bronchial gland showed early tubercles. Tubercle bacilli found in secretion.

Bronchial Glands.—Tuberculous; tubercle bacilli present.

Heart.—Normal.

Tongue, Pharynx, and Pharyngeal Glands.—Normal.

Pleura, Pericardium, Peritoneum.—Normal.

Stomach, Intestines (*Exterior*).—Normal. Interior not examined.

Brain and Membranes.—Normal.

Various Lymphatic Glands :

Prescapular.—Normal.

Popliteal.—Normal.

Mesenteric, Lumbar, Hepatic.—Normal.

CALF 22.

Fed with milk of Cow 4 for 34 days (for full notes *see* page 673.)

Killed—May 16th, 1903, 365 days after the experiment began.

ABSTRACT OF POST-MORTEM NOTES.

Caseo-calcareous nodules were found in all the Peyer's patches, some of those in the ileum being ulcerated; there was a caseating nodule on the palate, caseous nodules in the submaxillary and pharyngeal glands, encapsuled caseo-calcareous nodules, $\frac{1}{10}$–$\frac{3}{4}$ in. in diameter, in the mesenteric glands, and two nodules on the surface of the liver; the portal and thoracic glands were slightly affected; all other organs and glands were normal, except the right prescapular gland, which contained a few tubercles.

Animals Inoculated.

Nodules were removed from six of the mesenteric glands and emulsified with 60 cc. sterile salt solution.

Calf 114, Jersey Heifer 66, Shorthorn Heifer 100, were inoculated subcutaneously, each with 10 cc. of the emulsion.

GUINEA-PIGS INOCULATED WITH MILK OF COW 4.

Doses: 30 c.c. of the milk from each quarter were centrifugalised and the deposit inoculated into two guinea-pigs.

Date of Inoculation.	No. of Guinea-pig and Quarter of Udder.		Weight in Grammes.	Killed or Died.	Length of Life.		Result.
					Intrap.	Subcut.	
May 17, 1902. (This series of guinea-pigs was inoculated from the control quarters shortly after the inoculation of the cow (see cow 4.)	33	RF. quarter.		D		143	No Tuberculosis.
	34			K	144		Healthy.
	35	LH. ,		K		137	Healthy.
	36			K	144		Healthy.
May 29, 1902. (12 days after the cow was inoculated.)	63	RF. "	300	K		148	Healthy.
	64		290	K	148		Healthy.
	65	LH. ,	290	K		106	G.T.
	66		280	K	106		Healthy.
	67	LF. "	280	D		71	G.T.
	68		250	D	45		G.T.
	69	RH. "	250	D		81	G.T.
	70		320	D	91		G.T.
June 14, 1902. (28 days after inoculation.)	89	RF.	650	D		69	G.T.
	90		570	D	69		G.T.
	91	LH.	650	K		13	No Tuberculosis.
	92		620	D	88		G.T.
	93	LF. "	570	D		60	G.T.
	94		600	D	20		G.T.
	95	RH. "	770	D		85	G.T.
	96		620	D	21		G.T.

SHORTHORN HEIFER 100.

Subcutaneous inoculation of an emulsion made from the mesenteric glands of Calf 22.

Dose—10 cc. containing about 1,330· tubercle bacilli.

Date—May 16th, 1903.

Weight—3 cwts. 6 qrs. 20 lbs.

Killed—September 15th, 1903. 122 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck on May 16th, 1903.

A fortnight after inoculation there was an indefinite subcutaneous thickening measuring 2 in. by 1 in.

On June 6th, 3 weeks after inoculation, the swelling was more definite and larger, measuring 5 in. by 3 in.; the skin was adherent to it and a little puckered; from the upper extremity there was a nodular outgrowth which subsequently became completely separated from the main mass; the prescapular gland was distinctly enlarged.

The local tumour remained stationary in size for some time and then began to diminish. The prescapular gland grew much larger, measuring on June 30th, 6 in. in long diameter; it was difficult to measure on account of the large amount of surrounding fat. Towards the end of the experiment it showed a distinct diminution in size.

No signs of ill-health were noticed until after the tuberculin test on July 8th; this produced a severe reaction, both local and general, and the temperature was high for four days; the animal seemed to recover from the effects of this inoculation very slowly and was unwell-looking for several weeks afterwards.

The temperature was practically normal during the first 41 days, except for one quick rise to 39·6. It rose again from 39·3°C. on the 41st day to 40·2°C. on the 43rd, falling quickly to the normal. During the month of July and first few days of August there was (after the first tuberculin test) a period of irregular pyrexia, maximum 40·3°C.; subsequently the temperature was practically normal.

Tuberculin Tests.

July 8th, 1903. 53 days after inoculation.
Positive. Rise of temperature—2·4°C.

The temperature was high for four days and a very large œdematous swelling developed at the seat of inoculation of the tuberculin.

September 4th, 1903. 111 days after inoculation.
Positive. Rise of temperature—2·1°C.

September 11th, 1903. 118 days after inoculation.
Positive. Rise of temperature—2·1°C.

Weights.

From May 19th, 1903, to June 23rd, 1903, there was a gain in weight of 15 lbs.; from June 23rd to July 21st there was a loss in weight of 1 qr. 13 lbs.; subsequently there was a steady increase.

	cwt.	qrs.	lbs.
May 19th, 1903	6	2	26
June 23rd, 1903	6	3	13
July 21st, 1903	6	2	0
September 15th, 1903	7	1	15

Gain in weight during the experiment—2 qrs. 2 lbs.

POST-MORTEM EXAMINATION.

Carcass very well nourished—fat everywhere abundant.

At the seat of Inoculation.—There was a flattened subcutaneous thickening 4 in. by 2½ in.

On section the tumour was four-tenths of an inch thick, and consisted of dense fibroid tissue beset with yellow calcareous tubercles; at the anterior superior angle there was a small partially detached mass of similar tissue.

Left Prescapular Gland.—Weighed 3 ozs. and measured 3½ in. in length and 1½ in. in breadth; in the cortex of the upper half there were three caseous nodules, very gritty from calcification and numerous minute calcareous grains. The gland tissue in this part was firm, and the cut surface was granular. There seemed to be an increased amount of interstitial tissue; the lower part of the gland had a normal appearance, except for an occasional calcareous particle.

Right Prescapular Gland.—Weighed 2½ ozs. On section the tissue was œdematous, and showed a few petechial hæmorrhages.

In the sulcus between the second and third stomach there was a hard nodule the size of a walnut, firmly adherent to the stomach wall. On section there were seen small purulent foci in a sponge-work of soft fibrous tissue; the nodule had a thick fibrous capsule.

Abdomen.

Gastric Glands, Mesenteric Glands, Colic Glands, Intestines, Omentum, Peritoneum.—Normal.

Liver.—Weighed 13 lbs. 12 ozs. On the anterior surface in the depression between the right and left lobes there was a band 4 in. by ½ in. of firm flattened vegetations slenderly attached to the capsule. Over the centre of the left lobe there was an irregular group of similar vegetations. Rows of vegetations were seen also along the line of attachment of the suspensory ligament and on the ligament itself. On the surface of the left lobe of the liver vegetations in every stage of development were seen, from a just visible rounded translucent granule to a flattened vegetation two-fifths of an in. in diameter. The surface of the right lobe was smooth.

Beneath the capsule of the liver there were seen several collections (seven on the upper and on one the lower surface) of small yellow foci, the largest ½ in. in diameter and extending a quarter of an in. into the substance. They were not gritty to the touch, but caused a distinct roughening on the surface.

On the under surface of the liver there were two small rounded white tubercles.

Sparsely scattered throughout the parenchyma, some visible through the capsule, were pinhead sized yellow tubercles, gritty from calcification.

Hepatic Glands.—In the cortex of two of the hepatic glands there was a small calcareous tubercle; a third gland was normal.

Spleen.—Weighed 1 lb. 10 ozs. On the surface there were a few small vascular tufts. The substance of the spleen contained not more than six yellow calcareous tubercles, the size of a No. 4 shot. The Malpighian corpuscles were very prominent.

Suprarenal Bodies.—In the cortex of the right suprarenal, extending slightly into the medulla, was a small rounded caseo-calcareous tubercle. The left suprarenal was normal.

Kidneys.—In the cortex of the right kidney, immediately under the capsule, were seen four pearly-white rounded bodies, the size of mustard seeds. They were not hard to the touch, and showed no central caseation.

One similar body was in the cortex of the left kidney.

Diaphram.—On the abdominal surface of the diaphragm, on the left side, there were continuous plaques of dirty red vegetations, in the midst of which in several places were little greyish yellow tubercles.

The upper part of the left pillar of the diaphragm, and the central tendon, carried two reddish mushroom-like growths half an inch in diameter; near the latter especially were numerous vegetations: small tufts were seen on every part of the central tendon.

Thorax

Pleura.—Rows of reddish growths were arranged along the upper and lower margins of the ribs, particularly on the right side; some of the growths were soft and villous-like, containing here and there little hard tubercles; others were firm and flattened.

Lungs.—On the surface and throughout the parenchyma of the lungs were small tubercles, for the most part completely calcified (some of the tubercles were represented solely by calcareous grains). The majority of the tubercles were not larger than a wheat grain, but some attained the dimensions of a small pea, the latter showing a series of calcareous grains. When the fingers were passed over the cut surface of the lung, numbers of sharp gritty particles were felt, the particles being often more easily felt than seen. The tubercles were more numerous in the posterior lobes than the anterior, lying on an average (in the former) about half an inch apart ; some of the surface tubercles were capped by vascular tufts.

On the upper surface of the right posterior lobe there was a reddish flat pedunculated growth two-fifths of an inch in diameter ; similar growths were seen on the under surface of the right anterior lobe and on the anterior surface of the right posterior lobe. In the latter place, where the two lobes were in contact, plaques of reddish vegetations occurred on both surfaces.

A thick carpet of vegetations covered the pleura over the root of the right lung, and to a less extent that over the aorta.

At intervals around the margins of the lungs were firm reddish fringes containing here and there small nodules ; vascular fringes were also seen along the lines of the interlobular septa, chiefly on the diaphragmatic surfaces of the posterior lobes. In the midst of the thinned-out portions of both posterior lobes (four in the right and three in the left) were some nodules varying in size from a kidney to a garden bean ; one nodule was visible beneath the pleura as a reddish hepatised area. On section two had each a central cavity, containing thick viscid yellow pus, and a wall of fibrous and granulation tissue : the others consisted of granulation tissue and small purulent foci.

Thoracic Glands.—The long caudal mediastinal gland measured 6½ in. by 2¼ in. ; the tissue was firm and the cut surface granular ; in the cortex were numerous scattered calcareous grains.

The other mediastinal and the bronchial glands seemed slightly enlarged, and on section showed similar calcareous particles.

A continuous layer of slightly raised reddish vegetations covered the pericardial reflection over the great vessels.

Myocardium, Endocardium.—Normal.

Tongue, Pharynx. Tonsils, Œsophagus, Intestines, Gastric Glands, Mesenteric Glands, Colic Glands, Mammary Glands, Ovaries, etc.—Normal.

Other Lymphatic Glands :

Prepectoral, Right and Left Axillary, Cervical, Precrural, Popliteal, Gluteal, Ischiatic, Iliac, Lumbar, Submaxillary, Retro-Pharyngeal, Supramammary.—Normal.

Microscopical Examination (Smear Preparations).

Left Prescapular Gland *Kidney* *Right Suprarenal*	Tubercle bacilli.
Liver (small yellow foci), *Lung Nodule* *Stomach Nodule* *Local Tumour*	No tubercle bacilli.

Guinea-pigs Inoculated.

With emulsion from left Prescapular Gland :

No. 572. (S.) ; No. 573. (S.). Died of general tuberculosis in 39 and 31 days respectively.

No. 574. (I.) ; No. 575. (I.). Died of tuberculosis in 27 and 26 days respectively.

No. 576. With an emulsion made from one of the collections of yellow foci in the liver, remained healthy.

CALF 114.

Intramuscular inoculation of an emulsion made from the mesenteric glands of Calf 22.

Dose —10 cc., containing about 1,330 tubercle bacilli.

Date—May 16th, 1903.

Weight—1 cwt. 1 qr. 8 lbs.

Killed—October 23rd, 1903. 160 days after inoculation.

Clinical History.

The calf was inoculated on the left side of the neck on May 16th, 1903, the material being unintentionally introduced between the muscles.

Three weeks after inoculation a deeply situated firm elongated swelling, measuring 3½ in. by 1½ in., was felt in front of the left shoulder, the skin was freely movable over it; the prescapular gland was slightly enlarged.

The swelling became larger and measured on July 7th, 1903, 52 days after inoculation, about 6 in. in length by 2¼ in. in breadth; the margins of the tumour were not well defined and it was difficult accurately to measure its dimensions.

The tumour then diminished slightly in size; the prescapular gland on July 23rd, 1903, was not appreciably enlarged. The general health of the animal was unaffected by the inoculation.

Weights.

There was a steady progressive increase in weight.

	cwt.	qrs.	lbs.
May 19th, 1903 - - - -	1	1	8
October 20th, 1903 - - -	2	3	14

Gain in weight, 1 cwt. 1 qr. 8 lbs.

Average weekly increase, 7·9 lbs.

Temperature.

The temperature rose from 38·9° C. on the 17th day to 39·8° C. on the 19th; it then fell, and on the 22nd was normal.

It remained normal during the remainder of the experiment except for four quick rises, one to 40·4° C., towards the end of the experiment.

Tuberculin Tests.

July 8th, 1903. 53 days after inoculation. Positive. Rise of temperature 2·1° C.

October 21st, 1903. 158 days after inoculation. Positive Rise of temperature, 1·8° C.

POST-MORTEM EXAMINATION.

Carcass.—In moderately good condition.

Local Lesion—On reflecting the skin covering the left side of the neck, the subcutaneous tissues were found to be free from tubercle. On removing, however, a superficial muscle, an indurated tuberculous mass was exposed lying just under the anterior edge of the scapula.

The lesion had invaded and was entirely situated in one of the deep muscles. The part immediately beneath the aponeurosis formed a layer of confluent yellow nodules, whilst that part in the body of the muscle (about an inch thick) was composed of fibrous tissue beset with yellow tubercles, ranging in size from a pin-head to a large pea; many of the nodules were distinctly gritty in their central parts. Superficially the growth in the length of the muscle measured five inches; its transverse measurement for the lower two inches of its length was three and a half inches; for the upper three, one inch.

Left Prescapular Gland.—Was not appreciably enlarged (measured 2 in. by 1 in.); on section it showed in the cortex a calcified nodule ½ in. by ¼ in., and two yellow calcareous tubercles, the size of a small pea.

Prepectoral Glands.—One left prepectoral gland contained three calcareous grains, each the size of a mustard seed; a second prepectoral gland was normal.

Just within the anterior opening of the thorax, on the left side of the trachea, there was a hard gland, 1½ in. by 1¼ in. by ¾ in., which on section showed a thickened capsule and caseous contents, very gritty from calcification.

Two or three other small glands at the opening of the thorax resembled the mediastinal.

Left Axillary Gland.—Normal.

The subcutaneous tissues at the seat of inoculation of the tuberculin on the right side of the neck were thickened, congested, and infiltrated with œdema fluid; the underlying muscle and the tissues around the prescapular and prepectoral glands on the same side were also œdematous.

Right Prescapular Gland.—Was enlarged, measuring 2¾ in. by 1½ in. by ¾ in.; on section it was very œdematous, and showed throughout numbers of petechial hæmorrhages. No tubercle.

Right Prepectoral Glands.—Were also slightly œdematous.

Cervical Glands.—A gland in the middle of the neck, on the right side of the trachea, was enlarged to the size of a filbert, and œdematous. The gland on the opposite side was half that size. Both were free from tubercle.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Weighed twelve ounces. Not obviously enlarged; normal on the surface; contained in its parenchyma about twelve yellow calcareous tubercles, ranging in size from a pin-head to a small pea.

Liver.—On the anterior surface of the liver, beneath the capsule, embedded in the substance, two nodules the size of small peas were seen; one projected slightly and had a flattened surface: they were greyish white, with yellow gritty centres. Elsewhere the liver was normal.

Hepatic Lymphatic Glands.—Not enlarged. Two contained small yellow calcareous tubercles. Two small glands were normal.

Gall Bladder.—Normal.

Right Kidney (10 ozs.), *Left Kidney* (11 ozs.).—Normal on surface and on section.

Suprarenal Bodies, Gastric Glands, Mesenteric, and Colic Glands.—Normal.

Intestines.—Normal throughout.

Thorax.

Pleura.—The vascular fringes on the central tendon of the diaphragm were slightly more pronounced than normal, but contained no tubercles.

Along the margins of several of the ribs, chiefly on the left side, there were some soft pale granulations, a few of which contained little grey tubercles.

Lungs.—Projecting from the dorsal surface of the left cephalic lobe there were three firm greyish mushroom-like growths with considerably over-hanging margins; two equal in size, half an inch in diameter, the third a quarter of an inch in diameter. A nodule the same size as the latter was seen on the under surface of this lobe. On section they were yellow and calcareous in their central parts.

There were two similar growths in the right lobe; one, very congested, three-quarters of an inch long and one-third of an inch broad; the other a quarter of an inch in diameter.

Scattered around the growths first described there were about a dozen grey tubercles, in size from a small shot downwards. These were all on the surface, in some cases loosely attached, and sprang from the interlobular septa. Immediately beneath the pleura in that lobe there were two grey tubercles 4 mm. in diameter, yellow and calcareous in the centre; a similar tubercle was seen in the left posterior lobe and in the right middle lobe.

In the depth of the lung tissue no tubercles were seen.

Mediastinal Glands.—Seemed somewhat enlarged, and on section showed numerous yellow tubercles, very gritty from calcification; the gland tissue was firm and the cut surface granular.

Bronchial Glands were similarly affected.

Heart, Pericardium—Normal.

Uterus, Ovaries, Fallopian Tubes, Tongue, Tonsils, Pharynx, Larynx, Mammary Gland, Supramammary Lymphatic Glands.—Normal.

Various Lymphatic Glands:

Right Axillary, Right and Left Precrural, Right and Left Popliteal, Right and Left Gluteal, Right and Left Ischiatic, Right and Left Submaxillary, Right and Left Parotid, Right and Left Posterior Pharyngeal, Sacro-Iliac, Lumbar.—Normal.

Microscopical Examination (*Smear Preparations*).

Local Tumour.—Tubercle bacilli.

The Emulsion (see below).—Tubercle bacilli.

Liver Tubercle.—Tubercle bacilli.

Animals Inoculated.

An emulsion was made from the gland in the anterior part of the mediastinum, and equal quantities inoculated into:—

G.P. 651 (S.).—Died of general tuberculosis in 52 days.

G.P. 653. (I.).—Killed in 61 days; general tuberculosis.

G.P. 654. (I.).—Died of tuberculous peritonitis in 14 days.

HEIFER 66.

Subcutaneous inoculation of an emulsion made from the mesenteric glands of Calf 22.

Dose—10 cc. containing about 1,330 tubercle bacilli.

Date—May 16th, 1903.

Weight—4 cwt. 1 qr. 24 lbs.

Killed—October 10th, 1903. 147 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck on May 16th, 1903.

A fortnight after inoculation there was a slightly elevated firm tumour, measuring 4 in. by 3 in.

The tumour slowly grew larger and more prominent, and on July 7th measured 5 in. by 2¾ in. by about 1½ in.; it was tender to the touch and adherent to the skin. The left prescapular gland was about 5 in. in long diameter.

The tumour then remained practically stationary; the prescapular gland, however, diminished slightly in size.

No signs of illness were observed during the experiment, and the temperature remained normal throughout.

Weights.

During the first fortnight there was a loss in weight of 12 lbs.; then for 3½ months the weight fluctuated irregularly, varying between 4 cwt. 1 qr. 8 lbs. and 4 cwt. 2 qrs. 24 lbs.; on September 15th the animal weighed the same as at the beginning of the experiment; from September 15th to October 6th the animal gained 1 qr. 18 lbs.

	cwt.	qrs.	lbs.
May 19th, 1903 - - - -	4	1	24
June 2nd, 1903 - - - -	4	1	12
June 23rd, 1903 - - -	4	2	23
July 7th, 1903 - - - -	4	2	3
July 28th, 1903 - - - -	4	2	24
August 18th, 1903 - - -	4	1	8
September 8th, 1903 - - -	4	2	7
September 15th, 1903 - - -	4	1	24
October 6th, 1903 - - -	4	3	14

Gain in weight.—1 qr. 18 lbs.

POST-MORTEM EXAMINATION.

General Condition.—Moderate.

At the Seat of Inoculation.—On the left side of neck, beneath the skin, there was a tumour measuring about 5 in. long by 2¾ in. in thickness. The skin over this was intact, but thoroughly adherent to the growth. When cut out and divided, this growth was found to be composed of firm tissue, extensively caseated and slightly gritty from calcification.

In the connective tissue between this growth and the prescapular gland there were a few yellow tubercles.

The Prescapular Gland.—On the same line was enlarged to about three times the normal, measuring about 3½ in. in length by 2 in. in transverse diameter. On section the gland was found to be caseous almost throughout, the tubercles being also slightly gritty.

One left prepectoral gland contained two or three yellow gritty tubercles.

Cervical Glands.—About the middle of the neck, over the trachea, on the left side, there was a gland about ½ in. in diameter, containing caseous tubercles.

The corresponding gland on the right side was about a quarter that size, and normal in appearance.

Thorax:

Pleura (both Parietal and Visceral) and Heart.—Normal.

Lungs.—Contained some dozens of yellow tubercles, most about the size of barley grains, and yellow at the centre. There were also several caseous areas, each of which appeared to correspond with the outline of a lobule.

Thoracic Glands.—Both bronchial and mediastinal glands were enlarged to double the usual size and more, and were full of caseous tubercles: some were also appreciably gritty from calcification.

Abdomen:

Peritoneum.—Normal.

Liver.—Immediately under capsule of liver, but embedded in the parenchyma, were five tubercles, the smallest the size of a barley grain, the largest about twice that size. These were yellowish white in colour. In the same position there was a sixth tubercle, with fibrous capsule and completely calcified contents.

In the depth of the liver substance about half a dozen tubercles were found, similar in size and appearance to the one above described.

Hepatic Lymphatic Glands.—One contained one calcareous tubercle.

Spleen.—Normal in size. Three tubercles were found in its pulp, the largest about ½ cm. in diameter, the other two about half that size. These tubercles were yellow from caseation.

Kidneys.—Normal in size, and free from distinct tubercles, but a number of the lobules presented in the cortex small triangular streaks of doubtful character.

Suprarenal Bodies.—Normal.

Tongue, Pharnyx, Palate, Tonsils.—Normal.

Pharyngeal and Submaxillary Glands.—Free from visible tubercles.

Intestines.—Normal throughout.

Mesenteric Glands, Colic Glands, Gastric Glands.—Normal.

Udder, Suprammary Glands.—Normal.

Various Lymphatic Glands:

Right Prescapular.—Normal in size and free from visible tubercles.

Right and Left Axillary, Right and Left Popliteal, Right and Left Precrural, Right Prepectoral, Lumbar, Iliac.—Normal in size and appearance.

Microscopical Examination (Smear Preparations).

The Emulsion.—A few tubercle bacilli.

Hepatic Gland *Lung* *Spleen*	No tubercle bacilli.

Animals Inoculated.

An emulsion was prepared from the left prescapular gland, practically the whole being emulsified in 40 cc. salt solution; the emulsion was estimated to contain 18,666 tubercle bacilli per cc.

Calf 134 was inoculated subcutaneously with 11 cc. containing 205,326 tubercle bacilli.

Calf 136 was inoculated intraperitoneally with an equivalent dose.

Two guinea-pigs were inoculated subcutaneously and two intraperitoneally, each with 0·5 cc.; the former two died of general tuberculosis in 88 and 71 days respectively. One of the latter died in 18 days of slight tuberculosis, the other in 40 days of general tuberculosis.

CALF 136.

Intraperitoneal inoculation of an emulsion made from the prescapular gland of Heifer 66.

Dose—11 cc., containing 205,300 tubercle bacilli.

Date—October 10th, 1903.

Weight—1 cwt. 1 qr. 18 lbs.

Killed—April 15th, 1904. 188 days after inoculation.

Clinical History.

The calf was inoculated intraperitoneally on October 10th, 1903.

The general health of the animal was unaffected by the inoculation.

No lesion could be detected at the site of entry of the injection needle.

The temperature was slightly raised from October 22nd to November 8th, and was a little irregular at the end of November and in the early part of December; subsequently it was perfectly normal.

Tuberculin Tests.

December 6th, 1903. 57 days after inoculation. Positive. Rise of Temperature 1·8° C. April 7th, 1904, 180 days after inoculation. Positive. Rise of temperature, 1·4° C.

Weights.

From October 13th to October 27th there was a gain in weight of 17 lbs.; then for 3 weeks the weight was more or less stationary; during the remainder of the experiment there was a steady gain in weight.

	cwt.	qrs.	lbs.
October 13th, 1903 - - -	1	1	18
October 27th, 1903 - - -	1	2	7
November 17th, 1903 - - -	1	2	5
April 12th, 1904 - - -	2	3	0

Gain in weight.—1 cwt. 1 qr. 10 lbs.

Average weekly increase.—5·76 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

No lesion was seen in the subcutaneous tissues or in the muscles at the site of inoculation in the right flank.

Abdomen.—No fluid in the peritoneal cavity.

On the inferior surface of the omentum there were a few scattered firm nodules, ranging in size from a pin-head to a split pea; these had a translucent yellowish appearance, and contained in their centres calcareous grains; here and there on this surface, in the centres of the polygonal areas between the vessels, were seen delicate vascular fringes. Along the line of attachment of the omentum to the rumen a well marked band of soft reddish vegetations was seen; similar vegetations occurred in patches and in lines along the vessels on the surface of the rumen where it comes into contact with the parietal peritoneum. This surface also showed numerous soft connective tissue processes, to some of which were attached flattened nodules.

The contiguous surfaces of the omentum and the stomach were normal.

The parietal peritoneum in the antero-lateral regions (and on the right side of the diaphragm) was roughened with numerous pale granulations; that covering the central part of the floor of the abdomen (*i.e.*, the tendinous portion) was normal.

In the right flank the peritoneum presented about half a dozen firm flattened growths, ¼ in. to ½ in. in diameter, with a translucent yellow colour and a nodular surface. Three or four similar growths were seen on the left side along the margin of the diaphragm.

Spleen.—12 ozs. Was closely adherent to the diaphragm along its whole convex surface by numerous fibrous bands; no nodules seen on this surface. On the surface in contact with the rumen there were three greyish white hard bodies, about the size of a pin-head, two of which had a short peduncle; all contained calcareous grains. On section of the spleen, the pulp was found to be normal.

Liver.—The capsule on the convex surface showed numerous short tags of pale connective tissue and several large patches of an extremely thin greyish adherent membrane; the convex surface was normal. Liver substance normal.

Portal Glands.—Normal.

Diaphragm.—On the right side, over the muscle, the surface was roughened with numerous pale granulations; the left side was covered with soft connective tissue processes (some of these were attached to the spleen), and on the left pillar there was a series of dark red fleshy vegetations, which when cut into showed yellow foci towards their bases.

Scattered over the surface there were from fifteen to twenty flattened "grapy" bodies; these occurred chiefly along the margins of the diaphragm and on the left side; they were attached to the peritoneum by connective tissue strands, some of which were over ½ in. in length.

Similar bodies were seen on the serous surface of the rumen, and to a slight extent on the third stomach. The bodies were firm, usually of a lenticular shape, and measured from 2 to 3 mm. across. Many were opaque greyish white throughout; others were partly opaque and partly translucent.

On section the bodies were dry, of a tough consistence, and contained calcareous grains. A number had a pigmented appearance, some being slaty black in colour (this discolouration was probably the result of old hæmorrhages); several showed recent hæmorrhages; in two or three cases the hæmorrhage had occurred in the peduncle itself.

Abdominal Lymphatic Glands.—A gland on the rumen showed several yellow calcareous points.

In the sulcus between the rumen and the second stomach there was a large gland, which showed a few calcareous grains in the cortex; a gland on the third stomach contained a calcareous tubercle 2 mm. in diameter.

Other gastric glands were normal.

Two cœliac glands, not enlarged, each contained a few yellow calcareous foci, the size of a pin's head.

On the pancreas there were four small glands tuberculous; one was calcareo-caseous almost throughout, the other three contained small calcareous nodules.

Large Intestine, Small Intestine, Mesenteric Glands, Colic Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax:

Heart, Pericardium.—Normal.

Lungs.—Normal throughout.

Mediastinal Glands.—The caudal mediastinal gland, not obviously enlarged, showed on section two irregular calcareous masses, and a few scattered calcareous tubercles in the cortex.

The other mediastinal and the bronchial glands were normal.

In the fat between the apex of the heart and the diaphragm there was a gland the size of a broad bean, which contained a calcareo-caseous mass 1 cm. in diameter, and scattered calcareous grains in the cortex; a second but smaller gland near the latter was beset with calcareous tubercles; a gland the size of a pea between the heart and the sternum showed calcareous grains in the cortex.

Pleura.—On the pleura between the mediastinal and caval folds there was a flattened lenticular body, 1 cm. in diameter; it was pinkish externally, and consisted of dense fibroid tissue containing little yellow points. No calcareous grains were detected.

The parietal pleura was normal.

Tongue, Pharynx, Tonsils.—Normal.

The following lymphatic glands were normal:—

Parotid.
Submaxillary.
Pharyngeal.
Cervical.
Prescapular.
Prepectoral.

Axillary.
Precrural.
Popliteal.
Ischiatic.
Gluteal.
Sacro-Iliac.
Lumbar.

Microscopical Examination (*Smear Preparations*).

Pancreatic Gland.—Three tubercle bacilli.

Caudal Mediastinal Gland.—One tubercle bacillus.

Cœliac Gland *Spleen, Nodule on Surface* *Peritoneal Nodule*	No tubercle bacilli.

Guinea-pigs Inoculated.

With emulsion of caudal mediastinal gland:

G.P. 942 (S.).—Died of general tuberculosis in 47 days.

G.P. 943 (I.).—Died of general tuberculosis in 42 days.

With emulsion of spleen pulp:

G.P. 944 (S.).—Remained healthy.

With emulsions of peritoneal growths from right flank:

G.P. 945 (S.).—Died of general tuberculosis in 67 days.

With emulsion of pancreatic gland:

G.P. 946 (S.).—Died in 13 days, too soon for the development of tuberculous lesions.

CALF 134.

Subcutaneous inoculation of an emulsion made from the prescapular gland of Heifer 66.

Dose—11 cc., containing 205,300 tubercle bacilli.

Date—October 10th, 1903.

Weight—1 cwt. 1qr. 0 lb.

Killed—April 15th, 1904. 188 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 10th, 1903.

Five days after inoculation there was a slightly raised subcutaneous thickening, 2 in. in diameter; extending from the lower portion a short cord-like prolongation was felt (? thickened lymphatic); the prescapular gland was slightly enlarged.

On November 20th, 1903, the tumour had not increased in size, but had become harder and nodular.

Subsequently the tumour began to diminish slightly in size; it remained, however, for a long time flattened and nodular.

On March 25th, it had become more rounded, measuring 1½ in. in length by 1 in. in diameter, and gave a distinct sense of fluctuation.

The prescapular gland on December 9th, 1903, was about half as large again as the gland on the opposite side; at the end of the experiment it was normal in size. There were no signs of illness during the experiment.

Temperature.—There was some irregular pyrexia from October 28th to November 2nd (maximum 39·9° C.) and slight occasional irregularity of the temperature (maximum 39·5°C.) during the month of November.

Tuberculin Tests.—December 6th, 1903, 57 days after inoculation. Positive. Rise of temperature 1·7° C. April 7th, 1904, 180 days after inoculation. Positive. Rise of temperature 1·7° C.

Weights.

From October 13th to October 20th there was a gain in weight of 14 lbs.; from October 20th to November 24th, there was an increase of 3 lbs. only, the weight oscillating between 1 cwt. 1 qr. 5 lbs. and 1 cwt. 1 qr. 17 lbs.; subsequently there was a practically steady progressive increase in weight.

	cwt.	qrs.	lbs.
October 13th, 1903 - - - -	1	1	0
October 20th, 1903 - - - -	1	1	14
November 24th, 1903 - - - -	1	1	17
April 12th, 1904 - - - - -	2	1	2

Gain in weight.—1 cwt. 2 lbs.

Average weekly increase.—4·4 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a tense, elastic tumour, about the size and shape of a filbert. On section it was seen to be a cyst, with moderately thick fibrous wall lined with pale granulation tissue, and containing thick creamy yellow caseo-pus. The cyst was wholly subcutaneous, the wall being adherent to the skin on the one hand, and to the aponeurosis of the muscle on the other. Near the cyst there were about a dozen softened caseous nodules, ranging in size from a shot to a small pea; all were gritty in the centre.

Left Prescapular Gland.—2 in. by ¾ in. by (less than) ½ in. On section, no sign of tubercle.

Right Prescapular Gland.—2¼ in. by ¾ in. (a little over) ½ in. On section was œdematous and slightly congested.

There was slight œdema and congestion at the site of inoculation of the tuberculin on the right side of the neck.

Spleen.—11 ounces. Normal.

Kidneys.—The capsules of both kidneys stripped badly; the surfaces were granular; the substance was tough and fibroid. No sign of tubercle.

Lungs, Liver, Portal Glands, Suprarenal Bodies, Intestines, Tongue, Tonsils, Pharynx.—Normal.

All the lymphatic glands throughout the body, with the exception of the right prescapular gland, were normal in size and appearance.

Microscopical Examination:

> Smear preparations from the pus in the local tumour showed no tubercle bacilli.

Animals Inoculated.

Two guinea-pigs were inoculated, one subcutaneously, the other intraperitoneally, with an emulsion made from the left prescapular gland; both died of general tuberculosis, one in 54, the other in 58 days.

Three guinea-pigs were inoculated with an emulsion made from the local lesion, two subcutaneously and one intraperitoneally; these were killed 33 days later and separate emulsions were made from each, using for the purpose as much tuberculous material as could be collected; each of the three emulsions was inoculated intraperitoneally into two guinea-pigs; two of these guinea pigs (*i.e.*, those inoculated from the guinea-pig which had received the intraperitoneal inoculation) died in 6 and 7 days respectively; the other four were killed in 14 days, and the omentum, parietal peritoneum, spleen, pieces of the liver, and various glands from each animal were used to prepare an emulsion.

The emulsion was very rich in tubercle bacilli, containing approximately 235,740,000 bacilli per cc.

2·3 cc. of the undiluted emulsion = 542,202,000 tubercle bacilli, were inoculated subcutaneously into Calf 160.

1·9 cc. of a 1 in 100 dilution = 4,480,000 tubercle bacilli was inoculated subcutaneously into Calf 180; an equivalent dose was given to Goat 10.

8·5 cc. of a 1 in 10,000 dilution, containing approximately 200,000 tubercle bacilli were inoculated subcutaneously into Calf 178. 1 cc. of a 1 in 47,000 dilution, containing approximately 5,000 tubercle bacilli was inoculated subcutaneously into Calf 158; 1 cc. of the same dilution was inoculated subcutaneously into Goat 6.

Two guinea-pigs were each inoculated, one subcutaneously, the other intraperitoneally, with 1 cc. of the 1 in 47,000 dilution; both died of general tuberculosis in 47 days.

Two other guinea-pigs were each inoculated, one subcutaneously the other intraperitoneally, with 1·9 cc. of the 1 in 100 dilution; both died of general tuberculosis, the former in 57 days, the latter in 22 days.

CALF 158.

Subcutaneous inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 996-999 (*See* Calf 134).

Dose—1 cc. of a 1 in 47,000 dilution of the emulsion, estimated to contain about 5,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight—2 cwt. 2 qrs. 11 lbs.

Killed—October 21st, 1904. 141 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

At the end of nine days nothing could be felt at the seat of inoculation. On June 16th, 14 days after inoculation, there was a slight thickening; this remained unchanged for a few weeks and then became smaller and more indefinite. On September 1st, 1904, 91 days after inoculation, all that could be felt were a few shotty tubercles.

The prescapular gland was at first slightly enlarged and then became normal in size.

There were no symptoms of ill-health during the experiment.

Temperature.

With the exception of a slight rise to 39·5° C. on the 18th day, the temperature was normal throughout.

Weights.

	cwt.	qrs.	lbs.
June 2nd, 1904 - - - -	2	2	11
October 18th, 1904 - - -	2	3	16

Gain in weight.—1 qr. 5 lbs.

Average weekly increase.—1·68 lbs.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Doubtful. Rise of temperature 0·3° C.

October 7th, 1904. 127 days after inoculation. Rise of temperature 0·6° C.

October 20th, 1904. 140 days after inoculation. Doubtful. Rise of temperature 0·3° C.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Local Lesion.—In the subcutaneous tissues on the right side of the neck there were about a dozen isolated hard nodules, ranging from 2 up to 7 mm. in diameter; on section they showed caseo-calcareous centres surrounded by firm yellow translucent tissue, studded with petechial hæmorhages.

Right Prescapular Gland.—Measured 2¼ in. by 1 in. by ⅔ in. On section there was seen at one extremity a mass, 1 in. by ½ in. by ½ in., composed of caseous softened nodules bound together by translucent fibrous tissue; the largest nodule was about 5 mm. in diameter; all were slightly gritty from calcification. In the tissue around the nodules and in the cortex of the gland there were numerous petechial hæmorrhages.

At the other extremity of the gland there was a caseous nodule ½ in. in diameter, slightly gritty from calcification, which could fairly easily be shelled out from a thin fibrous capsule.

The subcutaneous tissues on the left side of the neck, at the seat of inoculation of tuberculin (18 hours previously), were infiltrated with œdema fluid.

Left Prescapular Gland.—Measured 2½ in. by 1¼ in. by 1 in. On section was œdematous and slightly congested.

Right and Left Prepectoral Glands, Axillary Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Spleen.—20 ozs. Normal on the surface and on section.

Liver, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Intestines.—In the ileum, beneath the mucous membrane, and in Peyer's patches, there were numerous hard pea-sized nodules, which projected on the mucous surface; on section some were grey, translucent, and homogeneous throughout; others showed greenish yellow central foci.

Gastric Glands, Mesenteric Glands, Ileo-Colic Glands, Colic Glands, Coeliac Glands, Renal Glands, Lumbar Glands, Iliac Glands.—Normal.

Thorax :

Heart, Pericardium, Pleurae.—Normal.

Lungs.—The lungs were spotted with petechial haemorrhages; otherwise normal on the surface and on section.

Mediastinal Glands.—A dorsal mediastinal gland, situated above the bifurcation of the trachea, contained in the cortex a yellow tubercle, the size of a pin's head.

The other mediastinal glands and the bronchial glands showed no tubercles, but were slightly enlarged, œdematous and congested.

Precrural Glands, Pudic Glands, Gluteal Glands, Popliteal Glands, Submaxillary Glands, Subparotid Glands, Retropharyngeal Glands were free from tubercles.

The left parotid gland was very congested.

Mammary Gland.—Normal.

Uterus.—contained a one month old fœtus.

Microscopical Examination (*Smear Preparations*).

A Nodule under the Skin.—Four tubercle bacilli.

An Intestinal Nodule }
Emulsion used for Guinea-Pigs } No tubercle bacilli.

Guinea-Pigs Inoculated.

Two guinea-pigs were inoculated, one subcutaneously, the other intraperitoneally, with an emulsion made from a caseo-calcareous nodule in the prescapular gland; both died of general tuberculosis, the former in 86 days, the latter in 47 days.

CALF 178.

Subcutaneous inoculation of emulsion made from the tuberculous organs of Guinea-Pigs 996–999. (*See* Calf 134.)

Dose—8.5 cc. of a 1 in. 10,000 dilution of the emulsion estimated to contain about 200,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight—2 cwt. 3 qrs.

Killed—November 2nd, 1904. 153 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

A fortnight after inoculation there was a firm tumour measuring 2 in. by 1½ in. by ¾ in.; the prescapular gland was enlarged to about twice the normal.

On June 22nd, 1904, 20 days after inoculation, the tumour was prominent and hemispherical and measured 2½ in. in diameter.

On July 29th the tumour attained its maximum (3¾ in. by 3 in.); it then diminished a little in size and became almost spherical.

The prescapular gland grew very large and measured on July 29th 6 in. in length; the rounded prepectoral gland was the size of a walnut; both glands were very hard and towards the end of the experiment diminished slightly in size.

During the last week of life the calf was a little seedy looking (rough coat) and seemed to have lost flesh; otherwise the general health of the animal was moderately good during the experiment; the malaise was probably due to the repeated tuberculin tests. The temperature began to rise on the 16th day and on the 18th day was 40·2° C.; from the 18th to the 60th it showed irregular intermissions between 39° C. and 40·2° C.; from the 60th day to the end of the experiment it preserved a lower level only slightly raised above the normal, and showed occasional sharp rises, one to 40·4° C.

Weights.

During the first fortnight the weight was stationary; then for a month there were slight oscillations above the initial weight; in the seventh week the calf lost 9 lbs. and weighed 7 lbs. less than the initial weight. From July 19th to September 27th, 1904, there was a steady increase in weight; during the last five weeks the calf gained only 3 lbs.

	cwt.	qrs.	lbs.
June 2nd, 1904 - - - - -	2	3	0
July 19th, 1904 - - - - -	2	2	21
September 27th, 1904 - -	3	2	12
October 11th, 1904 - - - -	3	2	3
November 1st, 1904 - - - -	3	2	15

Gain in weight during the experiment—3 qrs. 15 lbs.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Positive. Rise of temperature, 1·5° C.

October 7th, 1904. 127 days after inoculation. Positive. Rise of temperature 0·9° C.

October 20th, 1904. 140 days after inoculation. Positive. Rise of temperature 0·9° C.

October 26th, 1904. 146 days after inoculation. Positive. Rise of temperature 0·8° C.

POST-MORTEM EXAMINATION.

Condition.—Good.

Seat of Inoculation.—At the seat of inoculation, on the right side of the neck, there was a hemispherical firm tumour, weighing about 5 ozs. with the skin and muscle to which it was attached, and measuring 2½ in. by 2½ in. by 1½ in.

On section it showed in the centre a lenticular mass, 1¼ in. broad by about ⅔ in. in greatest thickness, of tough yellow caseated tissue, slightly gritty only around the margins; this mass was surrounded by a zone of white fibrous tissue about ⅙ in. thick; outside this again there was a zone of amber-coloured translucent tissue containing here and there opaque yellow gritty points. The skin was adherent and very thickened, and studded with translucent nodules with central gritty foci. Externally in the middle of the tumour, the skin showed an irregular ulcer ½ in. in diameter, covered over with a dry scab; the floor of the ulcer was pinkish and granular.

The growth was adherent to a superficial muscle, which showed in its substance a few isolated nodules, the largest the size of a pea, and small groups of nodules similar to those in the skin.

Right Prescapular Gland.—Weighed 11 ozs., and measured 4¾ in. by 2¾ in. by 2½ in. On section the substance of the gland was found to be composed of a dense translucent fibroid tissue closely infiltrated with a yellow necrotic network and studded with irregular calcareous particles; the tissue was divided up into large and small lobules by dense white fibrous trabeculæ. At each extremity of the gland there was an oval mass about 1 in. broad, consisting of dense yellow caseated tissue, gritty chiefly around the margins, but showing also in the central part minute opaque yellow points of calcification. The capsule of the gland was greatly thickened.

Left Prescapular Gland.—Measured 2½ in. by 1½ in. by, ¾ in., and was œdematous on section (recent tuberculin test), but showed no tubercle.

Prepectoral Glands.—On right side, three in number, each about the size of a pigeon's egg, consisted throughout of dense translucent fibroid tissue, penetrated with a yellow necrotic network, and studded with calcareous particles.

Cervical Glands.—Extending from the middle of the neck on this side along the carotid vessels to the first rib, there was a chain of four enlarged indurated glands, the largest the size of a pullet's egg, which on section resembled the prepectoral glands; one contained in the centre a small firm caseous mass, similar to those in the prescapular gland.

The corresponding glands on the opposite side of the neck were normal.

Right Axillary Gland.—Contained a nodule 1 centimetre in diameter.

Left Axillary Gland, Left Prepectoral Gland.—Were normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Spleen.—Weighed 1 lb. 2 ozs., and contained a dozen firm nodules, ranging in size from ¼ in. to a little over ½ in. in diameter. On section they consisted of translucent fibroid tissue containing a fine yellow network, and showed here and there minute calcareous grains. Six of the nodules formed rounded projections on the surface, from the summits of which soft connective tissue outgrowths proceeded.

Kidneys.—Left kidney slightly larger than the right; the capsule stripped badly; the substance was paler than normal and very tough; no tubercles seen.

Right kidney had a similar appearance.

Suprarenal Bodies.—Normal.

Liver.—Showed on the anterior surface four nodules, the smallest ½ in. in diameter, the largest 1 in. by ½ in. by ½ in. These were embedded in the substance, but projected slightly beneath the capsule; two of them had flattened surfaces with overhanging margins. Growing from the capsule covering them were soft fibrous tissue outgrowths; on the posterior surface there was a nodule ½ in. in diameter, and on the renal surface three nodules about ¼ in. in diameter; in the substance there were about fifteen spherical nodules, ranging from ¼ in. to an inch in diameter. On section they were caseous in the centre and had dense fibrous capsules; the central part in some of the nodules was only slightly softened in one spot, whilst in others it was almost entirely broken down.

Portal Glands.—Were enlarged to three or four times the normal size, and on section resembled the prepectoral glands.

Gall Bladder.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—Both lungs contained numerous nodules, ranging in size from a large pea to a small hen's egg; many of those immediately beneath the pleura formed rounded white projections, which in the case of some of the smaller ones was more than half the diameter of the nodule. On section these nodules had thick dense fibrous capsules and yellow caseo-purulent, occasionally gritty, contents.

On the diaphragmatic surface of the left caudal lobe there were three firm flattened mushroomed growths, the largest 1½ in. by 1 in.; they penetrated a slight distance into the substance of the lung, and were composed of pinkish translucent tissue infiltrated with a yellow network; the cut surface was appreciably gritty.

In the left cephalic lobe, at the sternal margin, there was a large solid triangular mass occupying several lobules; this on section consisted of firm translucent caseating tissue surrounding three or four cavities filled with caseo-pus.

In the right cephalic lobe there were two similar solid masses and several reddish collapsed areas.

In the anterior part of the right caudal lobe, near the margin, there was a mass 2 in. by 1 in. by 1 in., which on section was extensively caseated and softened; the mass was divided up into lobules by dense white fibrous tissue trabeculæ.

Pleura.—On the left side of the body of the tenth dorsal vertebra there was a firm, pinkish, mushroomed growth an inch in diameter and a quarter of an inch in height, attached to the pleura by a broad base.

On the left side of the mediastinal pleura, near its junction with the diaphragm, there was a similar growth, but more irregular in outline.

On section they resembled the growths on the surface of the lung.

On the mediastinal pleura, and on the left side of the diaphragm, there were some plaques of reddish vegetations.

Mediastinal Glands.—The caudal mediastinal gland measured 7 in. by 2½ in. by 1¾ in., and weighed 10 ozs. In front of this there was a continuous chain of enlarged glands, extending throughout the whole length of the dorsal mediastinum; these with the caudal gland together weighed 1 lb. On section they were very firm and gritty, and closely resembled the prepectoral and portal glands.

Bronchial Glands.—On the left side there were three. two the size of walnuts and one that of a small orange: the three together weighed 4 ozs.

The right bronchial gland weighed 1 oz.

They resembled on section the mediastinal glands.

Below the trachea, in front of the heart, there were two enlarged glands, one the size of a walnut, the other 2 in. by 1 in. by 1 in.; both on section resembled the mediastinal, but were not so gritty.

The peribronchial and ventral mediastinal (sternal) glands were similarly affected.

Testicles, Tongue, Pharynx, Tonsils, Small Intestines, Large Intestine, Mesenteric Glands, Colic Glands.—Normal.

Various Lymphatic Glands :

Right Popliteal.—Contained in the cortex a firm nodule ½ in. in diameter, with a calcareo-caseous centre.

Left Popliteal, Ischiatic, Precrural, Pudic, Iliac, Lumbar, Submaxillary, Retropharyngeal, Parotid, Mastoid.—Normal.

Microscopical Examination (Smear Preparations).

Pus from Lung Nodule }
Spleen } No tubercle bacilli.

Prescapular Gland.—Twelve tubercle bacilli.

Popliteal Gland.—No tubercle bacilli.

Mediastinal Gland.—Two tubercle bacilli.

Guinea-Pig Inoculated.

A guinea-pig inoculated subcutaneously with an emulsion made from a spleen nodule, died of general tuberculosis in 53 days.

CALF 180.

Subcutaneous inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 996–999.

Dose—1·9 cc. of a 1 in 100 dilution containing approximately 4,480,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight—2 cwt. 1 qr.

Killed—November 4th, 1904. 155 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

Thirteen days later there was a firm deep-seated tumour over which the skin was freely movable, except at one point, corresponding to the site of entry of the needle, where there was a small prominent nodule.

On June 29th, 1904, 27 days after inoculation, there was a triangular-shaped tumour the apex of which was near the angle of the jaw and the base a few inches from the shoulder; it measured about 5½ in. from apex to base and about 3 in. in greatest width, and was situated wholly in the deep structures of the neck, except for a small subcutaneous mass which projected from the posterior part of the tumour and was adherent to the skin. The prescapular gland at this time measured a little over 4 in. in length, and a prepectoral gland was almost as large as a billiard ball.

The tumour increased in size and became more prominent and pear-shaped. About the middle of August a sense of fluctuation was obtained, and on September 1st, 1904, 90 days after inoculation, the tumour seemed to be entirely softened; it then measured roughly 8 in. by 5 in. by 3 in., and showed at the postero-superior angle a small opening discharging caseo-pus; from this opening during the remainder of the experiment there was a constant discharge of thick caseo-pus and the tumour became smaller and more and more baggy and somewhat pendulous. On October 20th, 1904, the prescapular gland measured about 4 in. in length and the prepectoral gland was stony, hard, and about the size of a bagatelle ball.

On September 1st, 1904, the calf seemed to have lost flesh, otherwise there was no obvious alteration in the general condition.

Temperature.

The temperature began to rise on the 12th day, and on the 18th had reached 40·4° C.; it remained high for 8 or 9 days and then gradually fell to the normal; it soon rose again, and during the remainder of the experiment there was irregular pyrexia up to 40° C. with occasional short periods of normal temperature.

Weight.

During the first 5 days there was a loss in weight of 18 lbs. and for the next 9 weeks the weight preserved a moderately uniform level, From August 9th, 1904, to the end of the experiment there was a practically steady increase in weight.

	cwt.	qrs.	lbs.
June 2nd, 1904 - - - -	2	1	0
August 9th, 1904 - - -	2	0	10
November 1st, 1904 - - -	2	3	5

Gain in weight.—2 qrs. 5 lbs.

Rate of gain per week from August 9th to November 1st (84 days).—6·58 lbs.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Positive. Rise of temberature 1·2° C.

October 7th, 1904. 127 days after inoculation. Rise of temperature 0·5° C.

October 20th, 1904. 140 days after inoculation. Negative.

October 26th, 1904. 146 days after inoculation. Negative.

POST-MORTEM EXAMINATION.

Carcass.—In fair condition.

Seat of Inoculation.—At the seat of inoculation, on the right side of the neck, there was a soft fluctuant pear-shaped tumour, measuring 6½ in. in length by 5 in. by 3½ in. at its broadest part; the long axis had an antero-posterior direction, the narrow end being situated about 2 in. from the angle of the jaw. At the posterior superior angle the skin showed a small funnel-shaped opening, through which thick yellow caseo-pus exuded.

On removal the growth was found to be thoroughly adherent to the skin and to the superficial muscles, and weighed, with those attached, 1 lb. 12 ozs.

On section the tumour showed an oval cavity 4 in. in length, filled with greenish-yellow viscid pus, containing large irregular firm caseous masses. The walls of cavity varied in thickness, the external and deep walls being ½ in., the lateral 1 in., and the anterior about 1½ in. thick; from within they consisted of a layer of pinkish granulation tissue 4·5 millimetres thick, a zone of dense white fibrous tissue, which was adherent to and continuous with the muscle on the one hand, and the thickened skin on the other, and anteriorly and laterally pearly white fibrous tissue enclosing translucent amber-coloured nodules, the size of peas, with central yellow gritty points; the muscle and skin were studded with similar nodules. Running in the muscles between the local tumour and the neighbouring glands there were two firm cords, of the thickness of a lead pencil; one entered the hilum of the prescapular gland, the other that of the rounded prepectoral gland; they resembled in structure the nodules described above.

Right Prescapular Gland.—Weighed 3½ ozs., and measured 3 in. by 1½ in. by 1½ in. On section the greater part of the gland was composed of translucent fibroid tissue, closely studded with yellow calcareous grains and containing here and there small cavities filled with caseo-pus; in the midst of this tissue there was a lenticular mass, about ⅜ of an inch in diameter, of dense caseous tissue surrounded by a capsule of fibrous tissue. At one extremity of the gland there was more or less normal tissue closely studded with calcareo-caseous nodules; the capsule of the gland was greatly thickened.

Near the hilum there was a small gland which was normal on section.

Prepectoral Glands.—The most superficial gland was enlarged to about the size of a pullet's egg, stony hard, and studded externally with small yellow projecting nodules. On section the gland showed a narrow cortical zone, consisting of tissue similar to that in the lymphatic cords, surrounding a dense opaque yellow (pinkish in the centre) caseous medulla, gritty only around the margins; the two parts were separated by a zone of fibrous tissue.

A deeper prepectoral gland contained a firm translucent nodule, 8 millimetres in diameter, beset with yellow calcareous points.

Right Axillary Gland.—Searched for, but not found.

Cervical Glands.—The upper cervical gland on the right side, the size of a walnut, was calcareo-caseous throughout, and showed two or three foci of softening.

The middle cervical gland, the size of a filbert, was partly composed of translucent fibroid tissue, studded with calcareous grains, and partly of dense caseated tissue, gritty around the margins; the latter was enclosed in a fibrous capsule.

Between the latter and the first rib there were two smaller glands, less extensively affected.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Weighed 10 ozs., and was normal on the surface. On section it showed about twenty hard yellow spherical nodules, ranging from 2 to 4 mm.; all were gritty in the centre.

Kidneys, Suprarenal Bodies.—Normal.

Liver.—Showed on the surface about four dozen whitish nodules, which ranged in size from 4 to 10 mm. in diameter; some of these projected on the surface and had overhanging margins, irregular in outline; others were just visible beneath the capsule. On section they had dense white fibrous capsules, and firm and calcareous, or caseous and softened centres.

In the substance there were numerous similar nodules.

Portal Glands.—One portal gland was enlarged and closely beset with nodules, the largest the size of a French bean; they consisted of a translucent fibroid tissue, studded with yellow calcareous foci. Three other smaller glands each contained two similar, but smaller, nodules.

One cœliac gland resembled the latter.

Thorax :

Heart, Pericardium, Parietal Pleura.—Normal.

Lungs.—On the surfaces of both lungs, beneath the pleura, were fairly numerous nodules ranging in size from 1 to 2 mm. up to 1 cm. in diameter(seventy were counted on the surface of the left caudal lobe). Many formed rounded projections on the surface, and most were surrounded by narrow collapsed zones.

On section the larger nodules had dense fibrous capsules, and were filled with viscid caseo-pus, containing calcareous grains. The small nodules (*i.e.*. those 1 to 2 mm. in diameter) were firm and translucent, and showed calcified centres.

Similar nodules were scattered throughout the substance of the lung. The lung parenchyma between the nodules was normal in colour and texture.

The thin posterior margin of the right caudal lobe contained a solid mass 1¼ in. by ⅔ in., composed partly of reddish consolidated tissue, and partly of caseous and softened tissue; the latter part was divided into smaller areas by fibrous trabeculæ. Attached to the pleura covering the diaphragmatic surface of each caudal lobe there was a thin flattened growth, about 8 mm. across, consisting of firm translucent pink tissue studded with calcareous grains. The fringes around the margins of the lungs was normal in appearance.

Mediastinal Glands.—The caudal mediastinal gland measured 4 in. by 1½ in. by 1¼ in., and weighed 2½ ozs. On section the cortex was crowded with calcareous nodules and masses similar to those in the portal glands.

In front of this were four enlarged glands, similarly affected.

Bronchial Glands.—Were two or three times the normal in size; on section they resembled the mediastinal glands, but showed also several foci of softening.

Three small œsophageal glands contained calcareous nodules.

A small gland just within the anterior opening of the thorax, on the right side, was tuberculous throughout, and highly calcified.

Tongue, Pharynx, Tonsils, Thyroid.—Normal.

Small Intestine.—The small intestine throughout its whole length, but chiefly in the ileum, was studded with pea-sized, firm, submucous nodules, which, on section, were translucent and homogeneous, except for a greenish focus in the centre.

Large Intestine, Mesenteric Glands, Colic Glands, Uterus, Fallopian Tubes, Mammary Gland.—Normal.

Various Lymphatic Glands :

Ischiatic, Gluteal, Popliteal, Precrural, Iliac, Lumbar, Supramammary, Left Axillary, Left Prepectoral, Left Prescapular, Submaxillary, Retropharyngeal, Parotid.—Normal in size and appearance.

Microscopical Examination (*Smear Preparation.*)

Prepectoral Gland.—One tubercle bacillus.

Spleen.
Intestinal Nodule } No tubercle bacilli.

Guinea-Pig Inoculated.

A guinea-pig inoculated subcutaneously with an emulsion made from two liver nodules died of general tuberculosis in 76 days.

CALF 160.

Subcutaneous inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 996 to 999. (*See* Calf 134.)

Dose—2·3 cc., containing approximately 542, 202,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight—2 cwt. 3 qrs. 2 lbs.

Killed—November 9th, 1904. 160 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

On the next day a small tumour was felt at the seat of inoculation; this increased in size day by day and attained its maximum about the end of July.

On July 29th, 47 days after inoculation, the tumour was very prominent and heavy and measured about 7 by 4 by 4 in; the tissues around it and those of the dewlap were very œdematous (the œdema in the latter was first noticed on June 29th); the skin over the central part of the tumour was covered with dried secretion and showed beneath this fissures and small ulcers exposing caseous material

On September 1st the skin broke down and formed a discharging ulcer 3 by 1½; this gradually penetrated more deeply into the centre of the tumour, and on September 23rd there was a deep foul excavation, the skin around which was turned in and covered with dried discharge; the tumour as a result of the ulceration diminished in bulk. The tissues between the tumour and the gland were thickened and infiltrated.

The right prescapular gland, 13 days after inoculation, was 3¾ in. in length; on July 29th it was very large and measured nearly 7 in. in greatest diameter; subsequently there was a slight diminution in size. The calf first began to show signs of emaciation in the sixth week after inoculation; it then gradually became thinner and did not grow; when killed it was much emaciated.

Beyond this progressive emaciation there were no other symptoms until about October 20th, 140 days after inoculation; the respirations were then noticed to be quicker and there was occasional cough.

During the remaining period of the experiment the respirations continued to be a little quicker than normal, but were never very hurried.

The appetite was good throughout.

Temperature.

The temperature began to rise on the twelfth day; on the sixteenth it had reached 40·8° C. It remained high for six weeks, varying between 39·6° C. to 40·6° C., and then fell slowly to the normal. On the 74th day it quickly rose again, and in the 13th week fluctuated between 40.2° and 40·8°. Subsequently it fluctuated irregularly between 39·0° and 40·2°, only occasionally falling to the normal.

Weights.

In the first five days there was a loss in weight of 12 lbs.; then the loss was more gradual, 2 lbs. in three weeks; from June 28th to July 12th there was a loss of 1 qr. 2 lbs.; during the rest of the experiment the weight fluctuated irregularly between 2 cwt. 1 qr. 4 lbs., and 2 cwt. 2 qrs.

	cwt.	qrs.	lbs.
June 2nd, 1904 - - - - -	2	3	2
June 28th, 1904 - - - -	2	2	16
July 12th, 1904 - - - - -	2	1	14
August 9th and 16th, 1904 - -	2	1	4
October 18th, 1904 - - - -	2	2	0
November 8th, 1904 - - - -	2	1	26

Loss in weight.—1qr. 4lbs.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Positive. Rise of temperature 1·5° C.

October 7th, 1904. 127 days after inoculation. Negative. No rise of temperature.

October 20th, 1904. 140 days after inoculation. Negative. No rise of temperature.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated; very little subcutaneous or abdominal fat.

Seat of Inoculation.—At the seat of inoculation, on the right side of the neck, there was a firm tumour, measuring 6 in. vertically, 4 in. horizontally, and 2 in. in greatest thickness, and which weighed about 1 lb. 6 ozs.

The skin over the centre of the tumour showed a deep ulcer 2 in. by 1 in., with very irregular inverted edges; the skin around the ulcer was scaly, devoid of hair, and covered with masses of dried secretion; from the centre of the ulcer there was a discharge of yellow, foul-smelling pus.

On section of the tumour the ulcer was seen to communicate with a narrow cleft, 3 in. long by 1 in. broad, situated between the skin and the muscles; this was lined by pinkish granulation tissue covered over internally with a layer of soft yellow pus.

Surrounding this space, and forming the bulk of the tumour, were the greatly thickened skin on the one hand and fibroid (cicatricial) muscular tissue on the other: both the skin, which in one part was nearly 1 in. thick, and the muscles were studded with firm yellow nodules, calcareous in the centre; besides the nodules there were several small cavities filled with greenish yellow caseo-pus.

Stretching between the local tumour and the neighbouring glands there was a very thick nodular cord, consisting of dense translucent tissue studded with calcareous grains.

Between the local tumour and the neighbouring glands the subcutaneous tissues and the muscles showed numerous discrete calcareous tubercles; similar tubercles occurred in the loose connective tissues surrounding the prescapular and prepectoral glands.

Right Prescapular Gland.—Weighed 15 ozs., and measured 5 in. by 2¾ in. by 2¼ in. On section the cortex of the gland was composed throughout of dense pinkish yellow caseated tissue, slightly gritty around the periphery; the medulla showed numerous small highly calcareous nodules set in pearly-white fibrous tissue.

At the superior extremity of the gland there was a mass the size of a broad bean (glandular ?), which showed on section a firm caseated mass in the centre, surrounded by a translucent fibroid zone, gritty from calcification.

Prepectoral Glands.—The one nearest the local lesion was very hard, rounded, and measured an inch in diameter; on section it resembled the prescapular gland.

Posterior to the above, lying on the first two ribs, there were two enlarged glands; one weighed 2 ounces, and on section showed firm fibroid tissue studded with caseo-calcareous tubercles; at one extremity there was a cavity ¾ in. in diameter, filled with greenish yellow caseo-pus; the other was about half the size, and was studded with caseo-calcareous tubercles.

Cervical Glands.—A mid cervical and a lower cervical gland, the size of filberts, were caseo-calcareous throughout.

Between the latter and the first prepectoral gland there were two small glands, caseous throughout.

The superior cervical gland and the cervical glands on the left side were normal.

Right Axillary Gland.—Was a little enlarged, and showed in the cortex numerous caseo-calcareous nodules.

Left Axillary Gland.—Normal.

Prescapular and Prepectoral Glands.—On the left side normal.

Abdomen:

Omentum.—On the inferior surface of the omentum there were numerous nodules ranging in size from 3 or 4 millimetres to 1·5 centimetres in diameter; some of these were lenticular in shape, and had very long pedicles, others were attached by a broad base. On section they were dense, fibroid, and infiltrated with calcareous particles; some of the pedunculated ones were hæmorrhagic.

The surface in contact with the rumen was normal.

On the serous surfaces of the second and third stomachs, and on the small omentum, there were similar "grapy" bodies.

Spleen.—Weighed 11 ounces, ; the pulp was closely beset with nodules ranging from 3 to 10 millimetres in diameter; the nodules were firm, and in an advanced condition of caseous and calcareous degeneration; some projected from the surface, the capsule at these points showing pinkish connective tissue outgrowths.

Liver.—The right lobe of the liver was firmly adherent to the upper part of the diaphragm.

On the concave surface there were about fourteen flattened whitish projections with overhanging margins, the largest 5 millimetres in diameter; on the convex surface there were numerous similar growths; they were caused by nodules of various sizes, which were embedded in the liver substance; on the concave surface of the left lobe of the liver there were three or four prominent mushroomed growths, the largest 4 centimetres across, which caused only slight depressions in the liver substance, being separated from it by limiting membranes of fibrous tissue; these on section showed firm translucent tissue penetrated with a yellow network, and were very gritty from calcification. In the depth of the liver there were numerous spherical nodules, the largest 1 centimetre in diameter.

All the nodules had fibrous capsules and firm caseo-calcareous centres.

Gall Bladder.—On the serous surface there was a loosely attached gritty nodule, the size of a barley grain.

Portal Glands.—Were nodular on the surface, and on section crowded with caseo-calcareous nodules and masses.

Cœliac Glands.—The cœliac glands, four in number, were much enlarged and hardened; three were caseo-calcareous throughout; the fourth was beset with discrete nodules.

Kidneys.—The left kidney showed in the cortex several pale wedge-shaped areas; there were also a few scattered tubercles the size of mustard seeds; these were translucent throughout, or only slightly opaque in the centre, and showed no sign of caseation or calcification.

The right kidney resembled the left; one of the tubercles, however, was the size of a small shot, and was yellow and gritty in the centre.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Pleura.—The fringes along the margins of the ribs, particularly on the right side, were slightly hypertrophied. Loosely attached to the membrane on the right side were seven nodules, the largest the size of a pea; five of these were arranged in a cluster, the others were widely separated.

On the left side there were altogether six loosely pedunculated bodies, ranging in size from a barley grain to a small bean, and one flattened growth ½ in. in diameter; two of the nodules were hæmorrhagic.

Diaphragm.—On the pleural surface the tendon showed reddish velvety vegetations and several flattened growths, the largest 1 cm. in diameter; similar growths were seen on the caval fold of the pleura. On the peritoneal surface the right side of the diaphragm was covered with large prominent new growths, many of which were ½ in. thick. On section they consisted of dense translucent tissue penetrated with a yellow necrotic network, and infiltrated with calcareous patches; on the left side and around the margins there were a few large loosely pedunculated bodies.

Lungs.—The surfaces of the cephalic lobes were very irregular and nodular; besides numerous nodules projecting beneath the pleura, there were several mushroomed growths on the surface; the lobes were adherent to each other along the margin by slender threads of connective tissue, and also in many places where surface nodules came into contact; the fringes around the margins showed a number of firm nodules.

The surfaces of the caudal lobes showed a moderate number of mushroomed growths, the largest 1 cm. in diameter; they were most numerous on the diaphragmatic and mediastinal surfaces; the margin of the left caudal lobe showed a row of twelve flattened nodules, the largest 1 cm. in diameter.

The substance of the lungs was everywhere beset with nodules, ranging in size from a small shot to a barcelona nut; the nodules were caseous and calcareous and were surrounded by fibrous capsules; some of the larger ones were entirely softened or were beginning to soften.

In the cephalic lobes there were also large areas of consolidation, which on section were firm, reddish, and studded with calcareous tubercles. In the caudal lobes many of the lobules were similarly consolidated; the consolidated tissue usually surrounded a large nodule. In the posterior parts there were areas of consolidation affecting several lobules; these had a similar appearance to the above, but contained also cavities filled with yellow caseopus; the cavities communicated with the bronchi, which were dilated and filled with muco-pus. In the anterior part of the right caudal lobe, near the margin, there was a mass 2 in. by 1 in., which on section was firm and caseous throughout.

Mediastinal Glands.—The long caudal mediastinal gland was greatly enlarged, measuring 7 in. by 3 in. by 2 in., and weighing 13 ozs. In front of that, extending as far as the first rib, there was a chain of six very large glands, which together weighed 8 ozs. On section all the dorsal mediastinal glands consisted throughout of calcareo-caseous tissue, with a dense fibrous stroma; the capsules of the glands were greatly thickened.

Bronchial Glands.—Two on the right side together weighed 2 ozs. The left bronchial weighed 7 ozs. They resembled on section the mediastinal.

Below the trachea, in front of the heart, there were three glands, the largest the size of a filbert. On section two were indurated and studded with calcareo-caseous tubercles; the other showed calcareous grains in the cortex.

One inferior mediastinal gland contained two pinhead sized, gritty, caseous tubercles.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Pharyngeal Lymphatic Glands, Parotid Lymphatic Glands.—Normal.

Large Intestine, Small Intestine.—Normal throughout.

Mesenteric Glands.—One near the termination of the mesentery showed a pea-sized calcareous nodule; all the others were normal.

A gastric gland between the second and third stomachs was caseo-calcareous throughout.

Colic Glands, Testicles.—Normal.

Various Lymphatic Glands :

Left Popliteal.—Contained a pea-sized caseous, slightly gritty nodule.

Right Popliteal, Gluteal, Ischiatic, Precrural, Pudic, Parotid, Left Iliac.—Normal.

Lumbar, Sacro-Iliac, Right Iliac.—Each contained a pea-sized caseo-calcareous nodule.

Renal Gland.—Was closely beset in the cortex with calcareo-caseous nodules.

Microscopical Examination (Smear Preparations).

Right Prescapular Gland (Emulsion).—Numerous tubercle bacilli.

Spleen
Right Kidney } No tubercle bacilli.

Guinea-pigs Inoculated.

No. 1336 inoculated partly subcutaneously and partly intraperitoneally with emulsion from kidney (two small tubercles); died in 47 days of general tuberculosis.

No. 1337 inoculated intraperitoneally with an emulsion from the right prescapular gland; died of general tuberculosis in 130 days.

GOAT 6.

Subcutaneous inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 996 to 999.

Dose—1 cc. of a 1 in 47,000 dilution of the emulsion containing approximately 5,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight—2 qrs. 7 lbs.

Killed—November 10th, 1904. 161 days after inoculation.

Clinical History.

The goat was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

At the end of the eighth day nothing could be felt at the seat of inoculation.

On June 15th, 13 days after inoculation, there was a slight thickening, and on June 22nd, 20 days after inoculation, a small tumour, distinctly softened in the centre, about 1 in. in diameter and ½ in. in thickness; the prescapular gland was slightly enlarged.

On June 29th the tumour was uniformly softened and the skin over the central part reddened and thinned.

The skin subsequently broke down and the tumour gradually diminished in size, finally becoming represented by a slight thickening. The prescapular gland increased to about 2 in. in length and then became smaller.

There were no signs of ill-health during the experiment.

Weight.

From June 2nd to August 16th there was a gain in weight of 25 lbs.; during the last three months the weight was practically stationary.

	qrs.	lbs.
June 2nd, 1904 - - - - - -	2	7
August 16th, 1904 - - - - -	3	4
November 8th, 1904 - - - - -	3	0

Gain in weight.—21 lbs.

Temperature.

The temperature rose sharply on the 12th day to 41° C.; it then fell slowly, and on the 15th day was 39·5; for the following three weeks it was irregular, fluctuating between 35·2 and 39·8° C.; then for 7 weeks it was more or less normal, never rising above 39·3° C; in the 14th week there was a further period of febrile temperature. Maximum 39·7° C; subsequently with the exception of one or two slight rises the temperature was practically normal.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Positive. Rise of temperature 2·2° C.

October 7th, 1904. 127 days after inoculation. Positive. Rise of temperature 0·9° C.

October 20th, 1904. 140 days after inoculation. Positive. Rise of temperature 1·9° C.

October 26th, 1904. 146 days after inoculation. Positive. Rise of temperature 0·9° C.

November 1st, 1904. 152 days after inoculation. Positive. Rise of temperature 1·5° C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Seat of Inoculaton.—At the seat of inoculation, in the ubcutaneous tissues on the right side of the neck, there was a series of nodules bound together by white fibrous tissue, covering a triangular area 2in. by 1 in.; the nodules varied in size from a small shot to a large pea, and had caseous, softened, and slightly gritty contents.

The skin over the centre of the group showed a small opening, which was plugged with dry discharge. Between this group and the prescapular gland there were a few isolated nodules.

Right Prescapular Gland.—Weighed about an ounce, and measured 2 in. by 1⅜ in. by ¾ in. On section it was practically caseous throughout; the medullary part was wholly converted into a dirty white mortary caseous material, whilst the cortex was closely beset with softened caseous nodules; the cut surface of the gland was distinctly gritty.

Attached to the inferior extremity of this gland there was a small gland, which contained a cheesy gritty nodule one centimetre in diameter.

Right Prepectoral Gland.—Normal.

Left Prescapular Gland.—Was enlarged and œdematous, but showed no tuberculous nodules.

Cervical Glands, Axillary Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Spleen.—Was not enlarged; it contained in the pulp two pea-sized nodules, with translucent fibroid margins and softened caseous gritty contents.

Liver.—In the substance of the liver, just under the capsule, on the concave surface, there was a group of six or eight nodules, the largest the size of a pea, surrounded and bound together by a scanty matrix of fibrous tissue. The nodules were all caseous, softened and slightly gritty.

On the convex surface, just under the capsule, one pea-sized caseous nodule was seen; also a minute grey translucent tubercle.

No nodules were seen in the depth of the liver substance.

Portal Glands.—Two the size of small beans were closely beset with softened caseous nodules, the largest about 3 mm. in diameter, very gritty from calcification; a third gland, the size of a small pea, contained one caseous nodule.

Kidneys, Suprarenal Bodies.—Normal.

Intestines.—The mucous membrane of the small intestines was studded throughout its whole length with numerous ulcers; these occurred in the mucous membrane as well as in Peyer's patches, and were usually about 5 mm. in diameter; the ulcers had raised rounded margins and slightly thickened bases; in the centres of some of them there was a little yellow discharge. In a few Peyer's patches there were ulcers at least 1 cm. in diameter; these had very irregular margins and floors.

Large intestine normal.

Mesenteric Glands.—Were not obviously enlarged; almost all showed in their cortices small scattered caseous foci. The large terminal mesenteric gland showed numerous caseous foci, and one firm caseous mass 5 mm. in diameter. Many of the foci were surrounded by a zone of firm grey translucent tissue.

Ileo-Colic Glands.—Two in number; appeared slightly enlarged. On section they showed in the cortices numerous caseous areas of various sizes, gritty chiefly in the central parts.

Gastric Glands, Colic Glands.—Normal.

A gland on the pancreas contained a caseous focus.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—The right lobes contained altogether about twenty-four nodules; in the anterior lobes they were small, being not larger than a good-sized shot; in the caudal lobes they ranged in size up to that of a pea, and had thin fibrous walls and caseous softened contents; the smaller nodules were caseous, but firmer than the large ones, and were preceptibly gritty.

The left cephalic lobe contained three pea-sized caseous and softened nodules.

In the substance of the left caudal lobe, near the dorsal surface, there was a solid mass 1½ in. by 1 in. by 1 in.; this on section showed numerous thin-walled cavities of various sizes, filled with yellow viscid muco-pus; the cavities were surrounded by reddish consolidated tissue studded with small tubercles.

Immediately in front of this mass there was a thin-walled tense cavity the size of a pigeon's egg distended with air; the walls of the cavity were lined by a thin layer of pinkish granulation tissue which was covered internally with soft yellow viscid caseo-pus; the lung tissue surrounding the cavity was reddish and consolidated. Besides the above, the left caudal lobe contained a number of nodules ranging in size from 2 to 10 millimetres in diameter; these had fibrous capsules and softened caseous contents.

On the dorsal surfaces of both caudal lobes there were some irregular greyish patches which felt firmer than the surrounding lung; on section they were seen to penetrate a variable distance into the substance, and showed numerous minute semi-translucent foci (? parasitic).

Larynx, Trachea.—Normal.

Mediastinal Glands.—The caudal mediastinal gland was slightly enlarged; at the anterior extremity there was a caseous cheesy nodule the size of a sparrow's egg, gritty on section, and surrounded by a thin fibrous capsule; the posterior sixth of the gland appeared normal; the rest of the gland showed scattered caseous nodules, the largest the size of a pea.

A gland in the anterior part of the dorsal mediastinum contained three or four caseous nodules.

Bronchial Glands.—The left bronchial gland was slightly enlarged, and contained discrete caseous (cheesy) nodules, gritty from calcification.

The right bronchial gland was similarly affected.

A gland lying on the posterior surface of the left bronchus, the size of a marble, contained a caseous mass 1 centimetre in diameter, and several small nodules.

Thyroid, Testicles, Tongue, Pharynx, Tonsils.—Normal.

Various Lymphatic Glands:

Right Precrural.—Showed in the cortex a softened caseous and gritty nodule. about 3 millimetres in diameter.

Left Precrural, Popliteal, Iliac, Lumbar, Pudic, Submaxillary, Retro-Pharyngeal.—Normal.

Microscopical Examination (Smear Preparation).

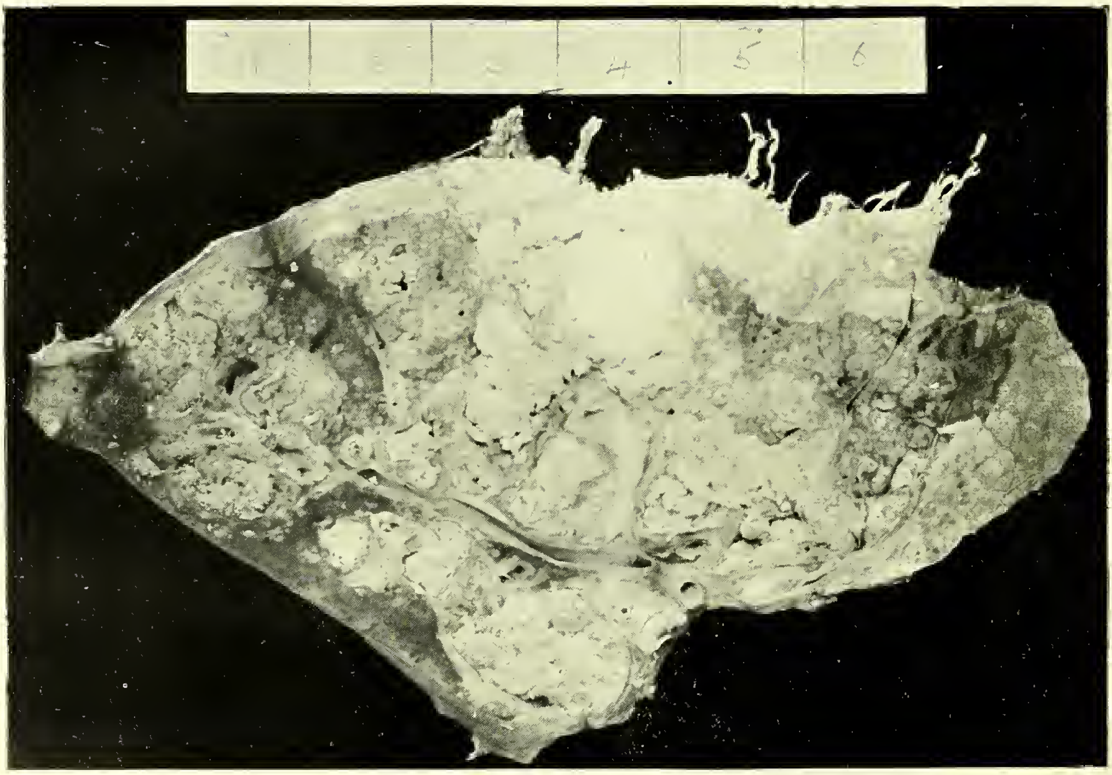
Prescapular Gland.—A few tubercle bacilli.

Liver.
Spleen. }—No tubercle bacilli.

Guinea-pigs Inoculated.

With emulsion made from the Prescapular Gland:

No. 1338. (S.).—Died of tuberculosis in 31 days.
No. 1339. (I.).—Died of tuberculosis in 39 days.



GOAT 10. Subcutaneous. Virus B. II.
Lung : cut surface of one of the caudal lobes.

GOAT 10.

Subcutaneous inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 996 to 999.

Dose—1·9 cc. of a 1 in 100 dilution of the emulsion, containing approximately 4,480,000 tubercle bacilli.

Date—June 2nd, 1904.

Weight

Killed—November 14th, 1904. 165 days after inoculation.

Clinical History.

The goat was inoculated subcutaneously on the right side of the neck on June 2nd, 1904.

On the thirteenth day there was a firm hemispherical swelling, 1½ in. in diameter.

On June 22nd, 1904, 20 days after inoculation, it was larger, 2½ in. by 2 in., and the skin over the central part was red and thin; the prescapular gland was very large and measured 3 in. in long diameter.

On July 1st, the skin broke down and an ulcer formed which on July 9th was ¾ by ½ in. in area; this ulcer then gradually diminished, and at the end of the experiment had almost healed; the tumour diminished in thickness but not much in area. The prescapular gland remained about 3 in. in length and became very hard.

On July 28th, a thickened nodular lymphatic cord was felt extending from the local lesion to the prescapular gland.

No symptoms of ill-health were noticed during the experiment.

Weight.

The weight fluctuated during the experiment, but within very narrow limits; the highest recorded weight was 2 qrs. 3 lbs., the lowest 1 qr. 19 lbs.

	qrs.	lbs.
June 2nd, 1904 - - - - - -	2	0
July 29th, 1904 - - - - - -	1	26
August 2nd, 1904 - - - - -	1	19
November 8th, 1904 - - - - -	1	25

Loss in weight during the experiment.—0 qrs. 3 lbs.

Temperature.

The temperature rose on the 8th day to 39·8°, then fell to below normal; on the 13th day it again rose to 39·9° C.; it continued about this level for 5 days, and on the 18th day rose to 40·7°; it then gradually fell with irregular intermissions to below 40°, but above normal, where it remained for about 3 weeks; in the 8th week it again rose to 40·7°, and for 4 weeks it was irregular (max. 40·2° min. 39°). From the end of the 13th week till death the temperature preserved, with few exceptions, a continuously high level, and fluctuated between 39·6 and 41° C.

Tuberculin Tests.

October 4th, 1904. 124 days after inoculation. Rise of temperature 0·6° C. (temperature high before the test).

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Seat of Inoculation.—The local tumour consisted of a collection of nodules, ranging in size from a pin's head to a small pea, bound together by a scanty matrix of fibrous tissue. The mass thus formed measured 2¼ in. by 1¾ in. by ½ in., and was situated partly in the subcutaneous tissues and partly in the superficial muscles. The skin over it was closely adherent, and showed in the centre an irregular healing ulcer, 1 centimetre across, the floor of of which was covered with a dry scab. The nodules were caseous, softened, and slightly gritty from calcification, Besides the nodules there were two cavities, the largest 1 centimetre in diameter, filled with soft caseo-pus.

Stretching between the local tumour and the prescapular gland there was a nodular cord, consisting of a series of caseous nodules surrounded and held together by fibrous tissue.

Right Prescapular Gland.—Weighed about 1 oz., and measured 2¼ in. by 1¼ in. by 1 in. On section it was found to be wholly converted into a dirty white putty-like mass, appreciably gritty from calcification; the capsule was slightly thickened. The fatty tissues around the gland contained numerous small caseous gritty tubercles.

Prepectoral Gland, Axillary Glands, Left Prescapular Gland, Left Prepectoral Gland, Cervical Glands.—Normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Was not obviously enlarged; the pulp contained about nine nodules, ranging from 2 to 4 mm. in diameter; these had translucent fibroid margins and cheesy, gritty centres; one of the nodules caused a yellow hemispherical projection on the surface.

Kidneys, Suprarenal Bodies.—Normal.

Liver.—Embedded in the substance of the liver, just beneath the capsule on the anterior surface, there were fourteen or fifteen nodules ranging in size from a pin's head to a large pea. On transverse section three of these were seen to be united with other nodules lying deeper in the substance, forming small groups of three and four. On section the nodules had pearly white fibrous capsules and cheesy, gritty contents. In the depth of the liver there were about half a dozen pea-sized nodules and a few minute tubercles.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged and closely beset with caseous and gritty nodules.

Cœliac Glands.—Four or five in number, were enlarged and tuberculous; the two larger ones were practically caseous throughout; the smaller ones were studded with caseous nodules.

Three glands in close relationship with the pancreas showed caseous softened areas in the cortices.

Thorax:

Heart, Pericardium.—Normal.

Pleura.—The parietal pleura on the right side was roughened with slender villous projections, at the bases of some of which little hard bodies could be felt. The left pleura was normal.

On the pleura stretching between the heart and the sternum there were numerous caseous gritty tubercles.

Lungs.—The left lung contained numerous nodules and seven or eight large masses. The nodules were evenly distributed throughout the lobes, those near the surface forming slight projections under the pleura. On section they were caseous, with thin fibrous walls, and showed varying degrees of softening, the larger ones being practically cysts filled with soft gritty caseo-pus. In the cephalic lobe, near the root of the lung, there was a cavity filled with caseo-pus, the size of a pigeon's egg; this communicated with the bronchus by a small opening.

In the caudal lobe, besides the nodules, there were several large masses, the largest 2 in. by 1½ in. by ½ in. They were seen on the surface as irregular greyish yellow slightly raised areas, over which the pleura was thickened. On section they were caseous and had fibrous capsules; some were completely broken down into chambered cavities filled with caseo-pus; others were composed of caseated tissue of the consistence of cream cheese.

The right cephalic lobe contained numerous nodules similar to those in the left lung, and several cavities, the largest the size of a pullet's egg.

The right middle lobe, except for a small portion on the ventral surface and at the extreme tip, was consolidated; near the root of the lung there was a large cavity filled with caseo-pus, which communicated with the bronchus; external to this the lobe was in a condition of caseous pneumonia; the cut surface showed softened caseous areas, which represented the centres of alveoli, surrounded by pinkish translucent tissue; the small portion of functional lung tissue contained several caseous tubercles.

The right caudal lobe was enlarged and extensively consolidated, very little functional lung tissue remaining; the pleura over the solid parts was thickened and had a greyish or greyish-pink translucent appearance; through it could be seen yellowish patches and foci; the surface was covered with villous projections similar to those on the parietal pleura.

On section the consolidated parts consisted chiefly of a series of large cavities filled with thick, slightly gritty greenish yellow caseo-pus, surrounded by translucent fibroid tissue; here and there there were patches of solid reddish translucent tissue, studded with yellow foci.

The crepitant portions of the lobe were beset with nodules similar to those in the other lobes.

The fringes around the margins were greatly hypertrophied, but did not contain tubercles.

The bronchi were filled with pus; before section pressure on the lobe caused pus to exude from the main bronchus.

A small amount of caseo-pus was found in the trachea behind the vocal cords.

The mucous membrane of the trachea and larynx showed no ulceration.

Bronchial Glands.—Were three or four times the normal in size, and closely beset with cheesy, very gritty nodules, the largest 3 to 4 mm. in diameter.

Mediastinal Glands.—The caudal mediastinal gland measured 4½ in. by 1⅓ in. by ½ in. On section it was crowded with nodules, and masses resembling those in the bronchial glands.

Three smaller glands anterior to this were similarly affected.

The nodules were embedded in firm translucent fibroid tissue, and were each surrounded by a thin capsule of white fibrous tissue.

Tonsils, Pharynx.—Normal.

Right Submaxillary Gland.—Enlarged and hardened; on section it showed in the cortex firm caseated patches similar to those in the mesenteric glands.

Left Submaxillary Gland.—Normal.

Left Pharyngeal Gland.—Considerably enlarged. Showed numerous irregular caseated patches.

Right Pharyngeal Glands.—About half the size; showed similar patches.

Intestines.—The mucous membrane of the small intestine showed very numerous ulcers throughout its whole length; in the ileum they were more closely grouped than in the duodenum, and in the last few inches had become continuous, producing large serpiginous ulcerated areas. The ulcers occurred in the mucous membrane as well as in Peyer's patches; in the former they were generally circular, and ranged from 5 to 10 mm. in diameter; in the latter several were very large and had irregular undermined edges. The margins of the ulcers were raised and the floors covered with a small amount of yellow discharge; the bases were only slightly thickened; the peritoneum over some of them was roughened and showed delicate processes of connective tissue.

The cæcum and first part of the colon showed numerous ulcers similar to those in the small intestine, the largest 1 cm. across.

One gastric gland was slightly enlarged and extensively caseous.

The glands attached to the duodenum were normal.

Mesenteric Glands.—The mesenteric glands, passing from the anterior to the posterior extremity, showed progressive degrees of enlargement; those in the anterior part were little, if at all, enlarged and contained isolated caseous nodules; in the middle of the mesentery the glands were definitely enlarged; the cortices contained caseous masses, which were practically continuous throughout; the terminal mesenteric gland was greatly enlarged, the cortex being caseous throughout. The medullary parts of these glands were soft and œdematous.

Ileo-Colic Glands.—A large ileo-colic gland contained very large caseated patches, which practically entirely replaced the gland substance. The caseated areas were firm, greyish white, and somewhat translucent, and showed in the central parts minute opaque yellow foci, which were slightly gritty.

Colic Glands.—Normal.

Uterus.—Normal.

Various Lymphatic Glands:

Precrural, Iliac, Ilio-Sacral, Lumbar.—Normal.

Microscopical Examination (Smear Preparation).

Prescapular Gland (Emulsion).—Numerous tubercle bacilli.

Guinea Pigs Inoculated.

Two guinea-pigs were inoculated, one subcutaneously the other intraperitoneally, with an emulsion made from the right prescapular gland; both died of general tuberculosis, the former in 74 days, the latter in 58 days.

CALF 212.

Intramuscular Inoculation of culture derived fom Heifer 66.

Dose—50 milligrammes.

Date—September 30th, 1904.

Weight—(4 days after inoculation) 1 cwt. 25 lbs. [Age 2½ months].

Died—October 25th, 1904. 25 days after inoculation.

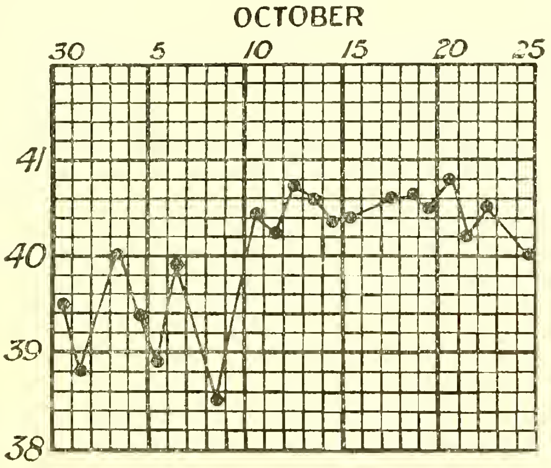
Clinical History.

The calf was inoculated on the left side of the neck on September 30th, 1904; the intention was to inoculate subcutaneously but, owing to the needle penetrating the deep fascia, the injection became entirely intramuscular. Three days after inoculation the muscles at the seat of inoculation were felt to be thickened and infiltrated; the infiltration gradually increased in extent, remaining confined to the muscles; the skin was hot but freely movable.

On October 20th, 1904, 20 days after inoculation, there was a deeply situated infiltrating tumour, projecting slightly beyond the surface and measuring roughly 6 in. by 4 in. The left prescapular gland measured 4 in. in length, and one of the prepectoral glands was felt to be enlarged and hard.

The calf became ill in the third week. On October 20th the respirations were very frequent; the coat was rough: the appetite poor, and the animal was obviously losing flesh. It very rapidly got worse, and presented all the signs of an acute pneumonia; there was occasional cough, and during the last few days almost complete anorexia.

Temperature.



Weight.

There was a steady decline in weight; during the last week the calf lost 22 lbs.

	cwt.	qrs.	lbs.
October 4th, 1904 - - -	1	0	25
October 18th, 1904 - - -	1	0	22
October 25th, 1904 - - -	1	0	0

Loss in weight—25 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition; very emaciated.

Local Tumour.—The local tumour was situated practically entirely in the midst of the superficial muscles on the left side of the neck; the skin was readily removable from the panniculus carnosus, except over a small area, which corresponded to the point of entry of the needle. At this point the subcutaneous tissues were infiltrated with caseous tubercles, which adhered to, but did not penetrate into the skin.

The tissues around the tumour and neighbouring glands were deeply congested and moderately œdematous; in the loose tissues of the lower part of the neck and in the dewlap there were large collections of gelatinous œdema fluid.

When removed and freed from most of the uninfiltrated surrounding muscles the tumour mass weighed about 1 lb. 2 ozs., and measured roughly 5½ in. by 5 in. by 2 in. at its thickest part.

On section the central part of the tumour was composed of dense juicy yellow necrotic-looking tissue, enclosing here and there small reddish islands, which probably represented the remains of muscle bundles.

The peripheral parts of the tumour consisted of œdematous and congested muscular tissue, closely studded with small yellow tubercles. In the necrotic portion in the upper part of the tumour there was an irregular cavity 1¾ in. by 1⅓ in. by about ¾ in.; this was filled with watery serous fluid, in which were suspended small masses of caseous débris; the walls of the cavity were irregular, caseous and shreddy.

The sterno-mastoid muscle between the tumour and the prescapular gland showed parallel rows of yellow tubercles between the muscle bundles.

Similar tubercles were seen on the deep aponeurosis of the sterno-mastoid near its insertion.

Left Prescapular Gland.—Weighed about 3 ozs., and measured 3¼ in. by 2 in. by 1⅛ in. On section about half the cortex was composed of firm yellowish-white caseated tissue; the rest of the cortex showed numerous caseous foci studding a firm translucent matrix; the medullary portion of the gland was congested and œdematous, and showed isolated tubercles; the capsule was thickened.

Prepectoral Glands.—The rounded prepectoral gland, the size of a small marble, was indurated, and on section firm, pinkish yellow and caseous throughout.

A deeper gland, the size of a large bean, showed in one part of the cortex a small group of closely packed caseous tubercles and in the rest of the cortex isolated tubercles. The substance of the gland was very œdematous and intensely congested. A third and very small gland showed no tubercle.

Just within the entrance to the thorax, on the left side, there was a large gland, measuring 1in. by 1 in. by ¾ in., which on section consisted throughout of firm yellow caseo-necrotic tissue.

A gland on the opposite side, the size of a small marble, was œdematous, hæmorrhagic and beset with opaque miliary tubercles.

***Abdomen*:**

The peritoneal cavity contained a small quantity of serous fluid.

Omentum.—The omentum, on its inferior surface, presented numerous firm greyish-white congested tubercles ranging from 1 to 2·5 mm. in diameter; there were also numerous very minute grey specks. The vascular fringes in the middle of the polygonal areas of the omentum, and along its line of attachment, were not hypertrophied, but were intensely congested.

There were a few tubercles on the serous surface of the rumen, and a few on the peritoneum covering the floor of the abdomen.

Spleen.—11 ozs. No tubercles on the surface; the pulp was dark in colour, and packed almost as closely as possible with slightly opaque tubercles, the largest the size of a pin's head.

Liver.—5 lbs. 13 ozs. Enlarged, of a yellowish-red colour; substance very closely beset with grey miliary tubercles, the largest about 1 mm. in diameter; some of the tubercles showed very minute central opacities.

The gall bladder was distended with thick bile, and showed in the mucous membrane two opaque yellow points (tubercles ?).

Portal Glands.—Were enlarged, and showed in the cortices very numerous caseating tubercles, singly and in groups.

Kidneys.—In the cortices of both kidneys, on the surfaces as well as on section, there were very numerous tubercles, ranging in size from a mustard seed to that of a pin's head; most of the tubercles showed beginning caseation. No tubercles were seen in the medullary zones.

Suprarenal Bodies.—Right suprarenal body showed one minute tubercle in the cortical zone and one in the medullary zone.

Left suprarenal showed two or three suspicious foci in the cortex.

Small Intestines.—The mucous membrane throughout the whole length of the small intestines showed numerous greyish-white miliary tubercles; on the serous surface there were similar tubercles, prominent, hard, and about the size of mustard seeds.

The mucous membrane was everywhere intensely congested.

The mucous membrane of the cæcum and colon was also very congested and in parts hæmorrhagic.

Mesenteric Glands.—All the mesenteric glands were œdematous, and showed scattered throughout the cortices pinhead-sized opaque caseous tubercles; each tubercle was surrounded by a zone of congestion.

Gastric Glands, Colic Glands.—Were similarly affected.

Thorax :

The pericardial sac contained a small amount of serous fluid.

Pericardium.—Normal.

Heart.—Under the pericardium over the right ventricle there was a minute grey tubercle in the muscle.

The cavities of the heart were filled with dark red clots; these extended into the smallest branches of the pulmonary artery. The muscle substance was pale.

On the endocardium of the right ventricle there were two minute pearly white tubercles.

Valves normal.

Pleura.—The fringes along the margins of the ribs were slightly hypertrophied and of a dark red colour; they showed here and there small tubercles. The mediastinal pleura showed isolated patches of velvety vegetations.

On the pleural surface of the diaphragm there were patches of velvety vegetations, containing a few opaque miliary tubercles.

Lungs.—The lungs were very heavy; weight 7 lbs. 10 ozs.; the substance was friable, uniformly dark red in colour, and packed almost as closely as possible with grey tubercles about the size of mustard seeds; the lobes had a semi-solid feel, and pieces cut from various parts either sank or just managed to float; the cut surface of the lung exuded blood-stained œdema fluid, which was only very slightly frothy.

The trachea and bronchi were filled with frothy œdema fluid.

Bronchial Glands and Mediastinal Glands.—Were enlarged, œdematous, and deeply congested.

The caudal gland measured 4 in. by 1½ in. by ½ in.; the surface was mottled with irregular yellowish patches. On section the cortex was firmer than normal, and had a greyish translucent appearance, showing at intervals irregular greyish or yellowish white patches.

The other mediastinal glands were similarly but perhaps not quite so extensively affected.

The left bronchial gland was three or four times the normal in size; the cortex showed larger patches of yellowish white necrosed tissue than were seen in the mediastinal glands.

The right bronchial and the peribronchial glands resembled the left bronchial.

The bronchial and mediastinal glands together weighed 3½ ozs.

The ventral mediastinal glands showed a few caseous foci.

All the vertebral glands contained caseous foci.

Tongue.—Was normal.

Pharynx.—The pharyngeal mucous membrane showed a pinhead-sized tubercle.

Tonsils.—Each tonsil contained two or three caseating tubercles.

Pharyngeal Glands, Submaxillary Glands.—Were œdematous and intensely congested, and contained numerous caseous tubercles.

The following lymphatic glands were examined, and found to contain in the cortices numerous small caseous tubercles:

Parotid.
Cervical.
Axillary.
Precrural.
Pudic.
Iliac.
Ilio-sacral.
Lumbar.
Right Renal.
Popliteal.
Gluteal.
Ischiatic.
Left Prescapular.
Left Prepectoral.

The majority of the glands were deeply congested, and many of the tubercles were surrounded by zones of congestion.

Numerous hæmo-lymph glands, in various parts of the body, were examined, and all showed similar caseous tubercles.

Testicles.—In the substance of the left testicle there was a minute grey tubercle; two similar ones were seen in the right testicle.

Thyroid Body.—Normal.

Brain and Spinal Cord (with membranes).—Normal.

Microscopical Examination (Smear preparations):—

Smear Preparations from :—

Spleen.—Showed very numerous tubercle bacilli.

Liver.—Showed moderately numerous tubercle bacilli.

A Hæmo-lymph Gland,
Tonsil,
Testicle. } Showed numerous tubercle bacilli.

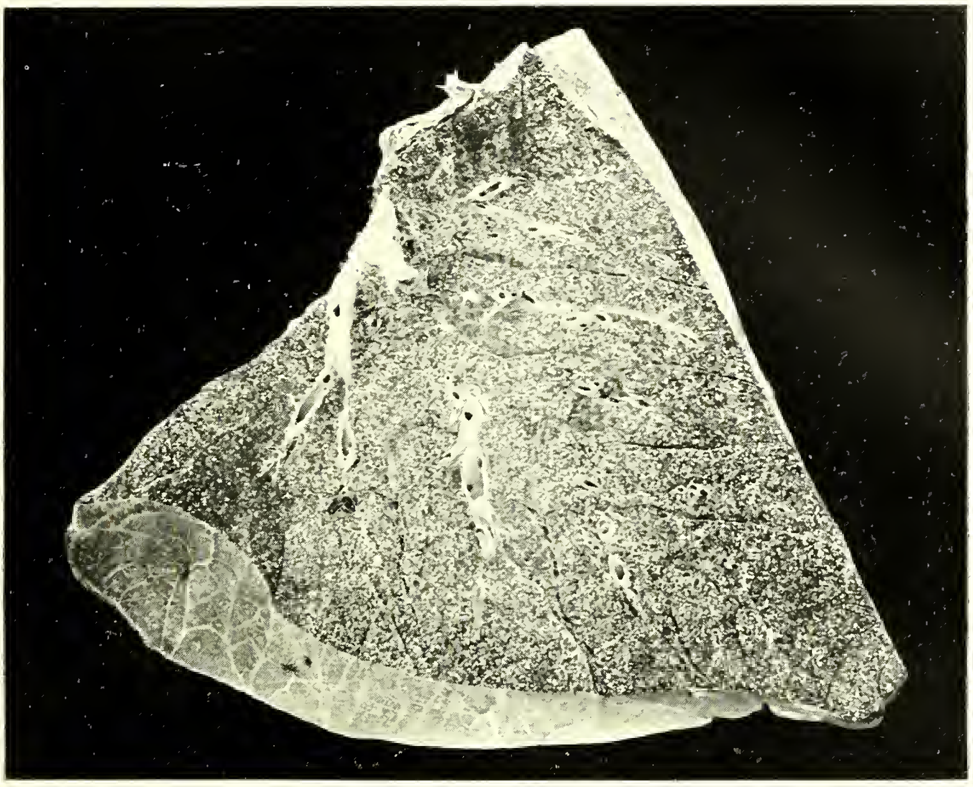
Small Intestine: (*a*) *Tubercle from Mucous Surface,* (*b*) *Tubercle from Serous Surface.*—Showed numerous tubercle bacilli.

Emulsion for Guinea-pig,
Mesenteric Gland,
Left Pharyngeal Gland,
Popliteal Gland. } Showed numerous tubercle bacilli.

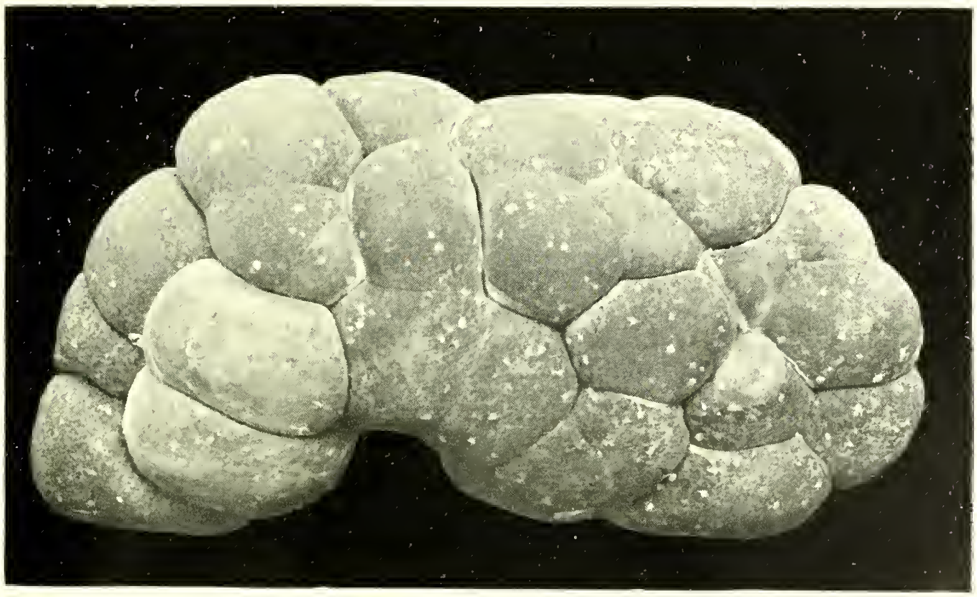
Right Suprarenal
Spinal Fluid. } Showed no tubercle bacilli.

Guinea-pig Inoculated.

A Guinea-pig inoculated subcutaneously with an emulsion made from the large gland just within the entrance to the thorax on the left side. Died of general tuberculosis in 44 days.



CALF 212. Subcutaneous. Virus B. II.
Lung: cut surface of left caudal lobe, showing the miliary tubercles.



CALF 212. Subcutaneous. Virus B. II.
Kidney, showing miliary tubercles.

CALF 226.

Subcutaneous—Inoculation of culture obtained direct from the local lesion of Calf 134.

Dose—50 milligrammes.

Date—November 28th, 1904.

Weight—3 qrs. 18 lbs.

Killed—December 23rd, 1904. 25 days after inoculation.

Clinical History.

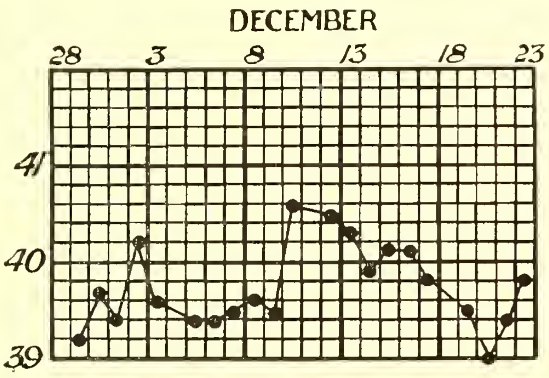
The calf was inoculated subcutaneously on the left side of the neck on November 28th, 1904.

A small lump was felt on the following day: this gradually increased in size and on the fourth day became a flat subcutaneous thickening, 3 in. by 2 in. in area; the prescapular gland was about twice the normal in size.

The tumour grew rapidly and on December 16th, 1904, 18 days after inoculation, measured 6 in. by $3\frac{3}{4}$ in. by $1\frac{1}{2}$ in.; the dewlap was slightly œdematous; the prescapular gland measured 4 in. in length.

On the latter date the calf was first noticed to be ill; it appeared to have lost flesh; the respirations were increased and there was occasional cough. During the next week the respirations became more frequent and there was obvious emaciation. The calf was killed 25 days after inoculation to compare with Calf 212; it was very ill, but not in a dying condition and would probably have lived a few days longer.

Temperature.



Weight.

There was a steady loss in weight.

	qrs.	lbs.
November 30th, 1904 - - -	3	18
December 23rd, 1904 - - -	3	6

Loss in weight.—12 lbs.

Average loss per week.—3·36 lbs.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—At the seat of inoculation there was a firm flattened tumour, somewhat oval in superficial outline, measuring 6 in. by 4 in. by 1 in., and weighing with skin and infiltrated muscle, 12 ozs.

On section the main mass of the tumour consisted of pinkish yellow juicy necrotic tissue, studded with hæmorrhagic foci; in the centre of the upper part of this tissue there was a series of small irregular spaces, filled with clear reddish yellow serous fluid. The muscles under the upper part of the tumour were infiltrated, and showed on section a dense yellow network. The skin was intimately adherent, and beset with yellow congested tubercles. Around the local tumour and the prescapular gland there was a moderate amount of œdema. A lymphatic vessel passing from the local tumour was thickened, and in a state of early caseation.

Left Prescapular Gland.—Measured $3\frac{3}{4}$ in. by $1\frac{3}{4}$ in. by $1\frac{3}{4}$ in. On section it consisted throughout of salmon-pinkish yellow caseated tissue, very similar to that in the local tumour. The capsule of the gland was thickened.

Left Prepectoral Glands.—The rounded prepectoral gland was $\frac{3}{4}$ in. in diameter, and on section resembled the prescapular, but was not so far advanced in caseation. The kidney-shaped gland showed two or three small opaque tubercles.

Cervical Glands.—A mid cervical gland just below the inferior extremity of the local tumour, the size of an acorn, resembled the rounded prepectoral; a small gland anterior to this was tuberculous in more than half its extent.

The gland on the left side, near the entrance to the thorax, showed discrete tubercles, and a small irregular translucent mass studded with caseous foci. The corresponding gland on the right side, the right mid cervical, and the left and right upper cervical glands, were beset with discrete caseous tubercles.

Abdomen:

Omentum.—The omentum on the inferior surface showed numerous hard translucent tubercles, the largest the size of a millet seed.

Spleen.—Weighed 10 ozs. It was distinctly enlarged, and on section was packed as closely as possible with slightly opaque tubercles, the largest about the size of a small shot.

Liver.—Weighed 2 lbs. 10 ozs., and was not obviously enlarged. The substance, only slightly paler than normal, was closely beset with grey tubercles, slightly opaque in the centre, varying from 0·5 to 1·0 mm. in diameter; the surface of the liver was granular to the touch.

Gall Bladder.—The mucous surface was studded with prominent tubercles, the largest the size of a No. 4 shot.

Portal Glands.—Were moderately enlarged: they showed throughout the cortices irregular patches of firm grey translucent tissue, studded with opaque whitish foci.

Coeliac Glands.—Similarly affected, one consisting practically throughout of grey tissue with the opaque foci.

Kidneys.—Each showed on the surface, as well as in the depth of the cortex, fairly numerous grey tubercles, ranging in size from a point just visible to the naked eye to a small shot; the larger tubercles were slightly opaque in the centre.

Suprarenal Bodies.—The medulla of the left showed a minute suspicious grey point; in the cortex of the left there was a similar focus.

Thorax:

Heart.—Pericardium, muscle and valves normal. On the endocardial surface of the left ventricle there were three minute opaque tubercles; the endocardium of the right showed one.

Parietal Pleura, Pleural Surface of Diaphragm.—Normal.

Lungs.—The lungs were moderately closely beset with opaque grey miliary tubercles; they were evenly distributed throughout the substance, and the majority were surrounded by irregular zones of congestion. In the ventral portions of the cephalic lobes there were several lobules that were dark red and consolidated; half the right middle lobe was thus involved; in the anterior parts of the caudal lobes there were a few consolidated lobules; the bronchi in the solid lobules were filled with yellow muco-pus.

Thoracic Glands.—Showed a moderate degree of enlargement. The caudal gland weighed about 1 oz.; the surface under the capsule was mottled with yellow patches; the cortex was firm, and showed grey tissue in a state of early caseation The medulla was soft, congested and œdematous.

The glands in the dorsal mediastinum anterior to this were similarly affected.

The bronchial glands were between two and three times the normal in size. They closely resembled the caudal gland, but were, if anything, a little more advanced in necrosis.

The peribronchial glands resembled the bronchial.

Two infratracheal glands were affected, but less extensively than the mediastinal.

Alimentary Tract:

Tonsils.—Showed numerous mustard seed sized tubercles.

There were several early tubercles under the mucous membrane of the palate and base of the tongue.

Thyroid Body.—Normal.

Intestines.—The majority of the Peyer's patches showed minute caseous tubercles under the mucous membrane.

No foci were seen in the large intestine.

Gastric Glands were slightly enlarged, and showed numerous discrete caseous foci.

Mesenteric Glands.—Not obviously enlarged; contained scattered caseous tubercles in the cortices.

Ileo-colic Glands, Colic Glands.—Contained similar tubercles.

Various Lymphatic Glands:

Lumbar.—Closely beset with opaque miliary tubercles.

Sacro-Iliac, Iliac.—Contained similar, but less numerous tubercles.

Precrural, Pudic, Popliteal, Gluteal, Right Prescapular, Right Prepectoral, Axillary, Œsophageal, Vertebral.—Resembled the iliac.

Pharyngeal, Submaxillary, Parotid.—Were closely beset with caseous miliary tubercles.

Ischiatic.—Contained a few caseous foci.

Most of the hæmolymph glands showed early tubercles.

Testicles }
Eyes }—Normal.

Microscopical Examination.

Gall Bladder.—Twelve tubercle bacilli seen.

Right Tonsil.—Two tubercle bacilli seen.

Tubercle from Left Ventricle.—Two tubercle bacilli seen.

Small Intestine.—Numerous tubercle bacilli.

Right Suprarenal.—No tubercle bacilli.

Left Suprarenal.—No tubercle bacilli.

VIRUS B III.

June 16, 1903.

MEDIASTINAL AND BRONCHIAL GLANDS.

ow with pulmonary and abdominal tuberculosis. The mediastinal and bronchial glands were very large and their substance was almost entirely replaced by yellow caseo-calcareous material.

TABLE 3A.

VIRUS B. III.
(JUNE 16, 1903.)

BRONCHIAL AND MEDIASTINAL GLANDS.

Dose = 14,600,000 T.B. in 10 c.c.

CALF 112. (Age, 14 weeks.)
Subcutaneous.
Killed, October 28, 1903.
(133 days.)

P.M.—Small local tumour; neighbouring glands caseous and calcareous; slight tuberculosis of spleen, liver and lungs.

G.P.s from prescapular gland.

660	340	86 days	G.T.	S.
661	289	55 ,,	G.T.	S.
662	250	40 ,,	G.T.	I.
663	270	46 ,,	G.T.	I.

GUINEA-PIGS.

Dose = 1,460,000 T.B.

438	300	D.	34 days	G.T.	S.
439	310	D.	31 ,,	G.T.	S.
440	350	D.	27 ,,	G.T.	I.
441	360	D.	40 ,,	G.T.	I.

RABBIT.

1	3220	K.	96 days	G.T.	S

Dose = 14,600,000 T.B. into each quarter.

COW 68.
Intramammary.
Killed, August 4, 1903.
(48 days.)

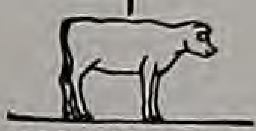
P.M.—Tuberculosis of inoculated quarters, supramammary glands and of iliac glands (slight); miliary tubercles in omentum and on serous coat of large intestine; lower end of ileum and a mesenteric gland slightly, lungs extensively, affected.

Supramammary gland.

GUINEA-PIGS

Supramammary gland.	518	Died	32 days	G.T.	S.
	519	,,	42 ,,	G.T.	S.
	520	,,	33 ,,	G.T.	I.
	521	,,	34 ,,	G.T.	I.
Spleen	517	Killed	43 ,,	G.T.	I.

Dose = 14,600,000 T.B.



CALF 108. (Age, 14 weeks.)
Subcutaneous.
Killed, November 9, 1903.
(145 days.)

P.M.—Small local tumour; neighbouring glands caseous and calcareous; moderate number of tubercles in spleen, liver and kidneys; calcareous tubercles in lungs and thoracic glands.

G.P.s from prescapular gland.

687	280	D.	52 days	G.T.	S.
688	380	D.	70 ,,	G.T.	S.
689	260	D.	58 ,,	G.T.	I.
690	420	D.	69 ,,	G.T.	I.

FED WITH MILK.

MONKEY 64.
Fed for 33 days.
Killed, September 24, 1903.
(87 days.)

P.M.—No ulceration of small intestines; two doubtful ulcers in cœcum; tuberculosis of omentum, peritoneum, of one gastric gland, liver and spleen. Large caseous nodule in one lung and enlarged caseous thoracic glands.

G.P.s from Spleen.

587	160	D.	22 days	S.T.	S.
588	210	D.	27 ,,	T.	S.
89	180	D.	24 ,,	T.	I.
590	160	D.	22 ,,	T.	I.

MONKEY 66.
Fed for 33 days.
Killed, September 24, 1903.
(87 days.)

P.M.—Primary tuberculosis of cœcum and colon (two ulcers); secondary tuberculosis of colic glands, of one gastric gland, one hepatic gland, of liver and spleen; of one bronchial gland and of both lungs (very slight).

G.P.s from Spleen.

591	270	D.	43 days	G.T.	S.
592	200	D.	25 ,,	G.T.	S.
593	250	D.	31 ,,	G.T.	I.
594	106	D.	33 ,,	G.T.	I.

CALF 116. SUCKING.
Fed for 47 days.
Killed September 18, 1903.
(92 days.)

P.M.—Slight tuberculosis of small intestine; about a third of the mesenteric glands affected; a small tubercle in the liver and one in the right lung.

G.P.s from Mesenteric Glands.

577	170	D.	33 days	G.T.	S.
578	130	D.	31 ,,	G.T.	S.
579	130	D.	8 ,,	T.P.	I.
580	180	D.	22 ,,	T.	I.
581	180	D.	3 ,,	A.C.	S.

CULTURE.

GUINEA-PIG.

714	180	D.	15 days	T.	I.

MONKEY 74.
Fed six times between November 21 and December 9, 1903.
Died, December 31, 1903.
40 days after first dose.

P.M.—Tuberculosis of small and large intestines; of the post-pharyngeal, submaxillary, cervical, bronchial, mesenteric and colic glands; a few caseous nodules in lungs; one tubercle in a kidney, one in liver and three in spleen.

GUINEA-PIGS.

Mesenteric glands	768	180	D.	10 days	T.P.	I.
	769	220	D.	18 ,,	T.	S.
Spleen	770	230	D.	22 ,,	T.	S.
	771	230	D.	18 ,,	T.	I.
Peritoneal fluid	781	220	D.	91 ,,	G.T.	S.

NOTE.—The full post-mortem notes of the Sucking Calf and the three Rhesus Monkeys are given in "Feeding Experiments with the Bovine Tubercle Bacillus," pages 675 and 654 to 656.

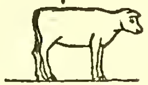
TABLE 3E.

Culture Inoculation.

Virus B. III.
(June 16, 1903.)

BRONCHIAL AND MEDIASTINAL GLANDS.

Calves inoculated on September 12, 1904, with culture (18 days old, 8th generation) derived from the original material; the total age of the culture was 427 days.

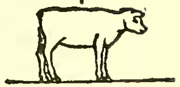


CALF 210.
Subcutaneous.
Dose: 0·02 mg.
Killed, January 23, 1905.
(143 days.)

P.M.—Small local lesion; neighbouring glands tuberculous; few tubercles in the liver and spleen and a considerable number in the lungs. Several lymphatic glands were affected.

RABBITS.

No.	Method.	Dose.	Duration of Life.	Result.
99	Intrav.	0·1 mg.	D. 18 days	G.T.
100	Intrav.	0·1 mg.	D. 24 days	G.T.
105	Intrap.	0·1 mg.	D. 25 days	G.T.
134	Intrap.	1·0 mg.	D. 14 days	G.T.
205	Intrap.	1·0 mg.	D. 21 days	G.T.
101	Subcut.	0·1 mg.	D. 102 days	G.T.
102	Subcut.	0·1 mg.	D. 99 days	G.T.



CALF 214.
Subcutaneous.
Dose: 50·0 mg.
Died October 26, 1904.
(45 days.)

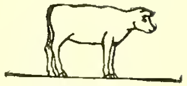
P.M.—Large caseo-necrotic lesion: general tuberculosis.

Culture

8th generation, 20 days old;
the total age of the culture was 147 days.

RABBITS.

No.	Method.	Dose.	Duration of Life.	Result.
234	Intrav.	1·0 mg.	D. 14 days	G.T.
235	Intrap.	1·0 mg.	D. 21 days	G.T.
236	Intrap.	1·0 mg.	D. 13 days	G.T.
237	Subcut.	1·0 mg.	D. 56 days	G.T.
238	Subcut.	1·0 mg.	D. 63 days	G.T.



CALF 248.
Subcutaneous inoculation on March 23, 1905.
Dose: 50 mg.
Died May 8, 1905 (46 days).
P.M.—General tuberculosis.

CALF 112. (Cow.)

Subcutaneous inoculation of an emulsion made from the original material of Virus B. III.

Dose—14,600,000 tubercle bacilli in 10 cc. of the emulsion.

Date—June 17th, 1903.

Weight—1 cwt. 1 qr. 17 lbs.

Killed—October 28th, 1903. 133 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 17th, 1903.

A week after inoculation there was a subcutaneous thickening 1½ in. by 1¼ in.; the prescapular gland was slightly enlarged. Three weeks after inoculation the tumour measured 4½ in. by 3 in. by about 1½ in., and the prescapular gland 5 in. in length and about 3 in. in breadth.

Subsequently both the tumour and the gland increased in size, but only to a very slight extent, and then gradually diminished.

There were no definite signs of ill-health during the experiment.

Tuberculin Test.

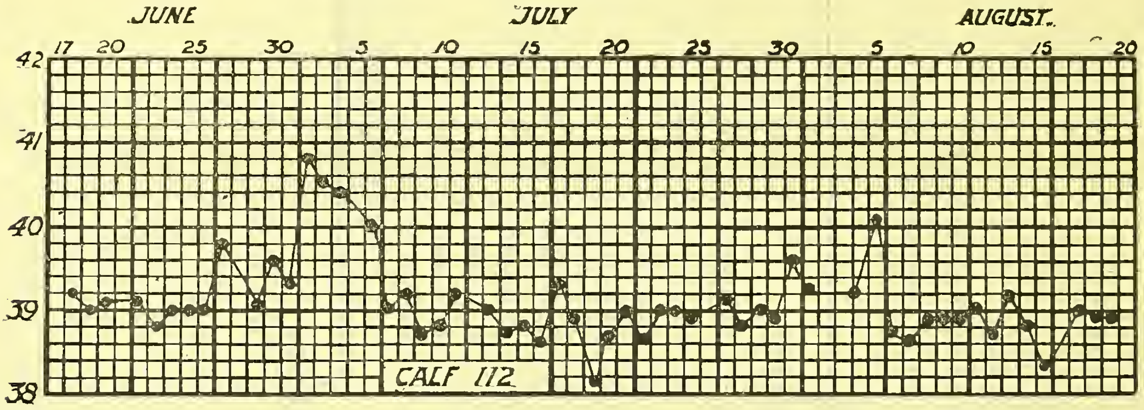
October 21st, 1903, 126 days after inoculation. Positive. Rise of temperature 1·8° C.

Weight.

The calf was weighed every week during the experiment and showed a practically steady increase in weight.

	Cwt.	Qrs.	Lbs.
June 16th, 1903 - - - -	1	1	17
October 27th, 1903 - - -	2	1	25
Gain in weight - -	1	0	8
Rate of gain per week -	0	0	6·3

Temperature.



With the exception of a sharp rise to 40·9°C. on September 18th, the temperature during the remainder of the experiment was normal.

POST-MORTEM EXAMINATION.

Condition.—Moderately good.

At the Seat of Inoculation there was a firm tumour, 4½ in. by 2½ in. by 1 in., adherent to the skin and the deep structures; the skin was not ulcerated nor thinned. On longitudinal section there was seen in the centre of the growth a dense, yellowish white, slightly gritty mass, 1¾ in. by 1 in. by ⅝ in., containing near one end a cavity half an inch in diameter, filled with thick yellow caseo-pus. The peripheral parts of the tumour consisted of fibroid tissue beset with caseous and calcareous tubercles.

In the interval between the tumour and the prescapular gland there was a thickened lymphatic vessel showing no sign of caseation.

Left Prescapular Gland.—Weighed 4 ozs. and measured 3½ in. by 2 in. by 1½in. On section it consisted throughout of caseating tissue very gritty from calcification: the capsule was thickened.

Left Prepectoral Glands.—Three in number, were not obviously enlarged; one, the size of a kidney bean, more superficial than the others, contained about six small yellow calcareous tubercles; a gland, deeper than the above, and larger, contained one similar tubercle. The third and smallest gland was normal.

Left Axillary Gland.—Normal.

Right Prescapular Gland.—Weighed about 1 oz. In the cortex there was a yellow, caseous, slightly gritty, tubercle 3 m.m. in diameter.

Left Parotid Gland.—Contained a similar tubercle.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Weighed 12 ozs. Normal on the surface; contained one yellow calcareous tubercle, the size of a No. 4 shot.

Liver.—Weighed 5 lbs. 8 ozs. On the anterior surface, immediately beneath the capsule and completely embedded in the parenchyma, there were two yellow tubercles, one the size of a pin-head, the other half that size: in the depth of the liver there were two tubercles similar in size and appearance to the latter. All were appreciably gritty.

Hepatic Lymphatic Glands.—Four in number. One contained two, another five, yellow calcareous tubercles, 2 to 3 m.m. in diameter; the remaining two were normal.

Kidneys.—Each weighed 8 ozs. Both were normal on the surface and on section.

Suprarenal Bodies.—Normal.

A gland near the anterior and inner end of the left kidney contained a small tubercle similar to those in the hepatic glands.

Alimentary Tract.

Tongue, Pharynx and Tonsils.—Normal.

Intestines.—Normal throughout.

Gastric, Mesenteric and Colic Glands.—Normal.

Thorax.

Lungs.—Scattered over the surfaces there were in all about twenty grey nodules ranging in size from 2 m.m. up to 6 m.m. in diameter; of the latter there were two, each on section showing several little foci of caseation. One of these projected considerably, and had slightly overhanging margins. All the nodules were appreciably calcified, and were most numerous in the left anterior lobe. The fringes around the posterior border of the left anterior lobe contained several small grey tubercles, yellow in the centre.

In the depth of the lung tissue there were only two or three small tubercles.

Pleura.—Costal pleura normal.

On the pleural surface of the tendon of the diaphragm on the left side there were some pale granulations; these did not contain tubercles.

Bronchial and Mediastinal Glands.—The caudal mediastinal gland was slightly enlarged, and showed on section twenty to thirty yellow calcareous tubercles 2 to 3 m.m. in diameter.

The glands anterior to this and the bronchial glands were similarly affected.

Ventral Mediastinal Glands.—Normal.

Two small glands along the œsophagus were normal.

Heart and Pericardium.—Normal.

Uterus, Fallopian Tubes and Ovaries.—Normal.

Various Lymphatic Glands :

Right Axillary.—Normal.
Right Prepectoral.—Normal.
Right Parotid.—Normal.
Right and Left Cervical.—Normal.
Right and Left Post-Pharyngeal.—Normal.
Right and Left Submaxillary.—Normal.
Right and Left Lumbar.—Normal.
Right and Left Iliac.—Normal.
Right and Left Precrural.—Normal.
Right and Left Popliteal.—Normal.
Right and Left Gluteal.—Normal.
Right and Left Ischiatic.—Normal.

Microscopical Examination.

Smears from :

The Emulsion (*see below*).—Showed tubercle bacilli.
A Liver Tubercle.—Showed tubercle bacilli.
A Hepatic Lymphatic Gland.—Showed tubercle bacilli.
The Right Prescapular Gland.—Showed tubercle bacilli.
The Left Parotid Gland.—Showed tubercle bacilli.

Guinea-Pigs Inoculated.

Four guinea-pigs inoculated with an emulsion made from the prescapular gland died of general tuberculosis in periods varying from 40 to 86 days.

CALF 108.

Subcutaneous Inoculation of an emulsion made from the original material of Virus B. III.

Dose—14,000,000 tubercle bacilli in 10 cc. of the emulsion.

Date—June 17th, 1903.

Weight—1 cwt. 1 qr. 0 lbs.

Killed—November 9th, 1903. 145 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 17th, 1903.

A week after inoculation a small swelling $1\frac{1}{2}$ in. in diameter was felt; the left prescapular gland was slightly enlarged. At the end of a fortnight there was a prominent firm tumour, $2\frac{1}{2}$ in. by 2 in., with a cord-like prolongation downwards; the prescapular gland measured 4 in. by 2 in. On July 8th, three weeks after inoculation, there was a prominent firm pear-shaped tumour measuring 5 in. by 3 in., to which the skin was intimately adherent; the prescapular gland measured 5 in. by $2\frac{3}{4}$ in. Subsequently both the tumour and the gland increased a little in size and then gradually diminished; the inferior extremity of the tumour became nodular.

The animal seemed a little seedy (rough coat) during the first week of September, but with this slight exception there were no signs of illness during the experiment.

Tuberculin Tests.

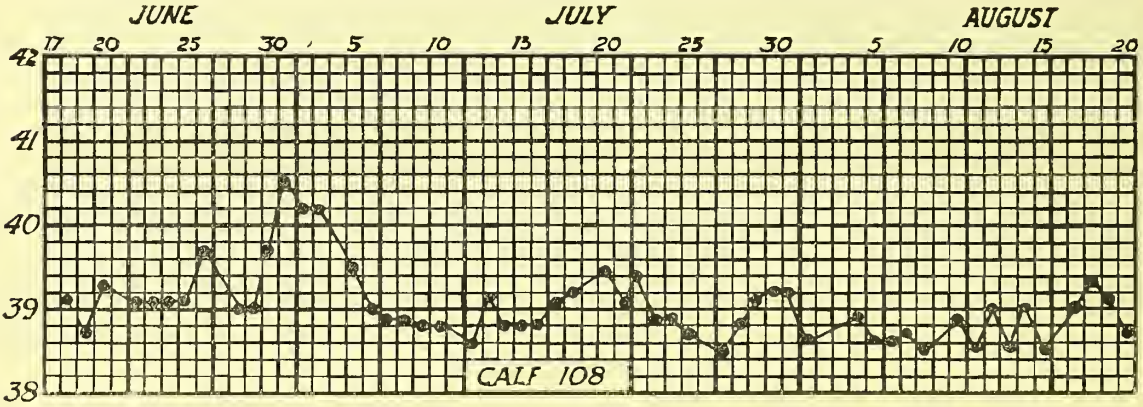
October 21st, 1903. 126 days after inoculation. Positive. Rise of temperature 2·4° C. November 3rd, 1903. 139 days after inoculation. Positive. Rise of temperature, 1·0° C.

Weights.

From the beginning of the experiment to September 15th there was a steady progressive increase in weight. Then for a fortnight the weight was more or less stationary. Subsequently there was again a steady increase in weight.

	cwts.	qrs.	lbs.
June 16th, 1903 - - -	1	1	0
September 15th, 1903 - -	2	0	5
September 29th, 1903 - -	2	0	4
November 3rd, 1903 - -	2	2	6
Gain in weight, 1 - -		1	6
Average weekly increase, -			7·05

Temperature.



The temperature from August 16th to the end of the experiment was practically normal.

POST-MORTEM EXAMINATION.

Carcass.—In moderately good condition.

Local Lesion.—In the subcutaneous tissue in front of the left shoulder there was a firm flattened growth, 4 in. by 2 in. On dividing, the growth was seen to consist mainly of tough fibroid tissue intimately adherent to the skin and inseparable from the muscle. In the midst of the fibroid tissue there were some dense yellow caseous masses, slightly gritty towards the margins; in other parts a few discrete yellow tubercles and small calcareous particles.

Left Prescapular Gland.—Weighed 3 ozs. and measured $3\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by 1 in. On section the cortex contained yellow caseous masses, slightly gritty around the margins; each mass was separated by a fibrous capsule, which was separated from the gland capsule by a thin layer of gland tissue; in addition to the caseous masses there were some calcareous parts showing very little caseous tissue; the gland tissue between the nodules had a normal appearance. The capsule of the gland was considerably thickened.

Prepectoral Glands—One slightly enlarged left prepectoral gland showed in the cortex a few minute yellow calcareous particles: a similar particle was seen in one of the deeper glands; a third gland near the latter appeared to be normal.

Cervical Glands.—A gland the size of a filbert, situated about the middle of the trachea on the left side, contained a calcareous nodule $\frac{1}{2}$ in. by $\frac{1}{5}$ in.

Other cervical glands were normal.

Abdomen:—

Omentum.—Normal.

Spleen.—Weighed $10\frac{1}{2}$ ozs. Normal on the surface, on section showed from twenty-five to thirty soft greyish yellow tubercles from 2 to 6 m.m. in diameter: most of these contained minute calcareous particles, but a few were homogeneous throughout. Some of the larger tubercles had a lobular outline.

Liver.—Weighed 5 lbs. 8 ozs. Beneath the capsule, on the anterior surface and embedded in the parenchyma, there were eight pale white nodules from 2 to 4 m.m. in diameter; on the posterior surface there was a greyish white slightly projecting nodule 6 m.m. in diameter. On section the nodules were grey and translucent, and contained minute yellowish slightly gritty central foci. Similar nodules were sparsely scattered throughout the substance. On the anterior surface the capsule presented several small pale growths, some of which were loosely attached, others somewhat mushroomed.

One hepatic lymphatic gland contained two small calcareous nodules; a second gland showed one.

Kidneys, Right.—7 ozs. In the cortex, and seen just beneath the capsule, were from eight to ten tubercles, two the size of a small pea, the others about the size of a mustard seed. On section the small tubercles were rounded and pearly grey throughout; the large ones somewhat wedge-shaped, yellow and calcareous in the centre.

Left.—7 ozs. Showed in the cortex about ten grey translucent tubercles, not larger than a mustard seed.

Suprarenal Bodies.—Normal.

Intestines.—Normal throughout.

Gastric Glands, Mesenteric, Colic, Peritoneum, Mammary Gland, Supramammary Lymphatic Glands, Tongue, Larynx, Pharynx, Tonsils.—Normal.

Thorax.

Lungs.—Contained numerous nodules 2 to 8 m.m. in diameter, evenly distributed throughout the parenchyma. In the anterior lobes many of the subpleural nodules formed prominent greyish white projections. In other parts those seen beneath the pleura had a dark grey colour and an irregular outline. On section the nodules were fibroid and calcareous, and contained little or no caseous substance. The nodules were somewhat more numerous in the left anterior lobe.

On the upper surface of the right posterior lobe there was a reddish firm flattened mushroomed growth 2 c.m. by 1·5 c.m.; on section it showed yellow gritty foci.

The fringes along the margins of the lungs were hypertrophied, firm and fleshy.

On the mediastinal pleura there was a thin layer of pale reddish granulations.

The fringes on the interlobular septa on the ventral surfaces of the posterior lobes were also hypertrophied.

Thoracic Glands.—The long mediastinal gland was enlarged, and contained a number of scattered discrete yellow calcareous particles.

Three glands anterior to this were similarly, but a little more extensively, affected.

The bronchial glands were enlarged to about twice the normal, and showed numerous calcareous foci. Some small glands along the oesophagus were similarly affected.

Ventral Mediastinal Glands.—Normal.

A gland in the anterior part of the dorsal mediastinum an inch in length, was partly caseous and calcareous.

The gland on the opposite side was normal.

Parietal Pleura.—Along the margins of the ribs, particularly on the right side, there were some pale flattened granulations; those on the last few ribs were thick and fleshy, and showed little yellow foci.

Plaques of reddish granulations were seen on the central tendon of the diaphragm.

Heart, Pericardium.—Normal.

Various Lymphatic Glands:

Right and Left Precrural, Right and Left Popliteal, Right and Left Gluteal, Right and Left Ischiatic, Right and Left Iliac, Right and Left Lumbar, Right and Left Posterior Pharyngeal, Right and Left Submaxillary, Right and Left Parotid, Right and Left Axillary, Right Prescapular and Right Prepectoral.—Normal.

Microscopical Examination (*Smear preparations*).

Left Prescapular Gland.—Tubercle bacilli.

A Kidney Tubercle.—No tubercle bacilli.

Guinea-pigs Inoculated.

Four guinea-pigs were inoculated with an emulsion made from the prescapular gland, and all died of general tuberculosis.

COW 68. (Virus B. III.)

Intramammary—Inoculation of emulsion of tuberculous bronchial and mediastinal gland.

Dose—{10·0 cc. into R.H. quarter. / 10·0 cc. into L.F. quarter.} of an Emulsion which contained 1,460,000 tubercle bacilli per c.c.

Date—June 17th, 1903.

Killed—August 4th, 1903. 48 days after inoculation.

Clinical History.

The cow was inoculated by an intramammary injection on June 17th, 1903. She was in milk, suckling a calf to which she had given birth forty-eight days previously. Her calf was taken from her immediately before the inoculation, and kept away for twenty-four hours. Within three weeks both infected quarters of the udder were considerably enlarged, the posterior part of the right hind quarter being very hard. Four weeks after the commencement of the experiment there was much œdema of the whole of the udder and of the abdominal wall; both infected quarters appeared to be tender. The animal was getting thinner. During the next week micturition was incomplete and seemed to be performed with difficulty.

The general health of the animal steadily declined throughout the experiment. During the last week it became obviously ill, the appetite was poor and there was marked emaciation.

The cow was killed on August 4th, but it would probably not have lived more than two or three days longer.

Tuberculin Test.

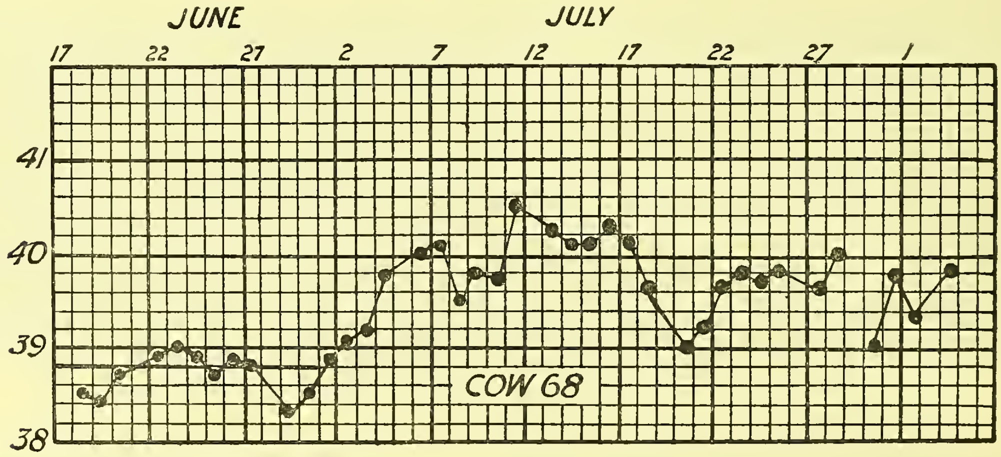
July 29th, 1903. Doubtful. Rise = 0·5° C.

Weights.

	cwts.	qrs.	lbs.
June 16th - - - - -	4	3	15
June 23rd - - - - -	4	3	24
June 30th - - - - -	4	3	4
July 7th - - - - -	4	3	22
July 14th - - - - -	4	3	10
July 21st - - - - -	4	1	21
July 28th - - - - -	4	2	10
August 4th - - - - -	4	1	17

Total loss of weight during experiment - 54

Temperature.



POST-MORTEM EXAMINATION.

General Condition.—Somewhat emaciated.

Mammary Gland.—There was œdema in the abdominal wall under, and for about 8 in. in front of the udder, where it was about 1½ in. thick. There was also very great œdema and great thickening of the subcutaneous tissues between the skin and infected quarters. The udder, with the skin and glands attached, weighed 31 lbs. The udder alone weighed 20 lbs. 4 ozs.

There was a sharp line of demarcation between the two quarters on the right side. The milk duct and large sinuses in the R.H. lobe showed well-marked tubercle nodules in the mucous membrane. The periphery of the quarter, especially the milk sinuses and posteriorly, was distinctly more tuberculous than the centre of the quarter. In this area there was well-marked caseation and slight calcification. There was an increase of connective tissue throughout the whole quarter.

The R.F. Quarter.—Was apparently unaffected.

The L.F. Quarter.—Was in a similar condition to the R. H. quarter, but not so far advanced in the upper and posterior portions. Yellow caseous nodules were seen in some of the tuberculous masses. There was also an increase of connective tissue throughout.

The L.H. Quarter.—Was unaffected.

Left Supramammary Gland.—Was greatly enlarged; weighed 1 lb. 4 ozs., and was divided into three portions. The anterior one, attached to udder immediately behind the infected quarter, was tuberculous throughout.

The greater part of the posterior gland showed typical caseous tuberculous masses. The posterior portion was unaffected for an extent of about two inches, the tuberculous disease evidently passing from before backwards.

Right Supramammary Gland.—Weighed 1 lb. 3 ozs., and was tuberculous throughout, caseation being fairly well marked. A small gland in front of this was also distinctly tuberculous. Another gland still further forward, with enormously thickened capsule, was caseous throughout.

Thorax:

Lungs.—On the surface of both lungs there was a number of small dark slightly projecting translucent tubercles; they varied in size from a millet seed to a good sized shot, the larger ones had a yellowish centre. The tubercles were moderately numerous over every part of the lung, but were perhaps more thickly crowded on the left anterior and the right middle lobes, where in addition were seen numerous grey miliary tubercles. Mapping out the interlobular septa in the anterior lobes were lines of pinkish granulation tissue, in which could be seen minute grey points; around the margins of the lungs were fibrinous fringes containing small grey points.

On section of the lung the tubercles were fairly evenly distributed throughout the substance. The lung was everywhere crepitant.

Pleura.—There was well marked tubercle on the costal pleura at the upper and lower margins of the ribs; in the dirty reddish grey masses there were numerous grey points.

Similar granulations were seen on the pleural surface of the diaphragm, at the junction of tendon and muscle.

Heart and Pericardium.—Normal.

Thoracic Glands :—

Caudal Mediastinal Gland.—Measured $5\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by $\frac{5}{8}$ in. was slightly congested, and showed one or two small tuberculous (?) points.

Oesophageal Glands.—Somewhat congested and soft; no naked eye evidence of tubercle.

Right Bronchial Gland.—Also congested and soft; no naked eye evidence of tubercle.

Abdomen :

Omentum.—The whole of the omentum, between the vessels, was covered with minute pinkish grey tubercles, following the course of the superficial lymphatics and continued on to the peritoneal covering of the stomach, well marked under the sternum. The tubercle was of very early date.

Small pinkish grey granulations were seen on the peritoneum, throughout the whole extent of the large intestine; they were more thickly massed together on that covering the lower end of the cæcum.

Spleen.—Weighed 1 lb. 9 ozs. Very early tuberculous granulations were seen where the spleen was in contact with the stomach. Malpighian bodies were very prominent. The substance of the organ was not very firm; there was no evidence of tubercle either in it or the Malpighian bodies.

Pancreas.—No trace of tubercle.

Liver.—No tubercle. Hepatic lymphatic gland normal.

Kidneys :

Right.—Weighed 1 lb. 6 ozs. No tubercle was seen either on surface or on section.

Left.—Weighed 1 lb. 8 ozs. No tubercle either on surface or on section.

Suprarenals, Right and Left.—Apparently normal.

Alimentary Tract :

Tonsils.—Normal.

Retro-pharyngeal Glands.—The gland on the right side was œdematous. No tubercle.

That on the left side was somewhat congested. No tubercle.

Sublingual Glands, Right and Left. Submaxillary Glands, Right and Left.—Not tuberculous.

Gastric Glands.—Normal.

Small Intestine.—At the lower end of the long Peyer's patch in the ileum there was a caseous tubercle the size of a wheat grain. In the mucous membrane between the latter and the ileo-cæcal valve there were at equal distances from each other three submucous tubercles, yellow and caseous in the centre, but not softened.

Large Intestine.—Normal, except for an excessive amount of dark pigmentation in the mucous membrane of the cæcum.

Mesenteric Glands.—One mesenteric gland, near the cæcum, showed a caseous nodule in the cortex.

Colic Glands.—Normal.

Uterus.—On the peritoneum of both horns of the uterus there were several small translucent tubercles; mucous membrane normal.

Various Lymphatic Glands :

Prescapular, Left.—$2\frac{1}{4}$ in. by $\frac{3}{4}$ in. by $\frac{1}{2}$ in.; no tubercle.

Prescapular, Right.—3 in. by $1\frac{1}{4}$ in. by $\frac{3}{4}$ in.; somewhat soft; contained much fluid, no tubercle.

Prepectoral, Left.—Very small; no tubercle.

Prepectoral, Right.—No tubercle.

Axillary, Right and Left; Popliteal Right and Left.—Normal.

Precrural, Right.—$1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. by $\frac{3}{4}$ in. Large quantity of fluid; no tubercle.

Precrural, Left.—$2\frac{1}{4}$ in. by 1 in. by $\frac{3}{4}$ in. No tubercle.

Iliac, Left.—Weighed 7 oz. Measured $4\frac{1}{2}$ in. by 3 in. by $1\frac{1}{2}$ in. One or two caseous nodules were seen in the cortex of this enlarged gland, but the amount of new tuberculous tissue, to naked eye, was very small.

Iliac, Right.—Weighed 9 oz. Measured $4\frac{1}{2}$ in. by 3 in. by $1\frac{3}{4}$ in. In a similar condition to the other gland. Only a few tubercle nodules here and there.

Two small glands were found to the right side in the immediate neighbourhood of the right iliac; both without tubercles.

On the left side were a couple of small glands, also without tubercle.

Gland at bifurcation of the aorta normal.

Microscopic Examination.

Udder.—Showed tubercle bacilli.

Supramammary Gland.—Showed tubercle bacilli.

Lung.—Showed tubercle bacilli.

Bronchial Gland.—No tubercle bacilli.

Intestinal Nodule.—No tubercle bacilli.

Guinea-pigs Inoculated.

Four Guinea-pigs inoculated from the supramammary lymphatic gland, and one from spleen, died of general tuberculosis.

CALF 116.

Sucking from Cow 68 from June 18th, 1903, to August 4th, 1903, a period of 47 days.

Killed September 18th, 1903. 92 days after the experiment began.

ABSTRACT OF POST-MORTEM NOTES.

Tonsils and pharyngeal glands normal. From eight to ten widely distributed caseous nodules, many of which were calcareous, where seen in the small intestine. Two of them were submucous, the rest were contained in Peyer's patches. Twelve mesenteric glands showed calcareous nodules, which in three were from $\frac{3}{4}$ to 1 in. in diameter; a few other glands showed minute calcareous grains. One tubercle was seen in the right posterior lobe of the lung; one also in the spleen. Other organs and glands normal.

Note.—The full notes of this animal are given in "Feeding Experiments with the Bovine Tubercle Bacillus," page 675.

GUINEA-PIGS INOCULATED WITH MILK OF COW 68.

Doses:—Each pair of guinea-pigs was inoculated with the centrifugalised deposit of 30 cc. of milk.

Date of Inoculation.	No. of Guinea-Pig and quarter of udder.	Weight in grammes.	Killed or Died.	Length of Life.		Result.
				Intrap.	Subcut.	
June 17, 1903. (This series was inoculated with the milk of the cow before her inoculation.)	430 R.F.	300	K		126	No Tuberculosis.
	431	410	K	126		
	432 L.H	370	D		78	Intestinal Obstruction.
	433	350	K	126		No Tuberculosis.
	434 L.F.	320	K		126	
	435	430	D	110		
	436 R.H.	310	D		126	
	437	380	K	126		
June 29, 1903. (12 days after the cow was inoculated.)	455 R.F.	300	K		117	Healthy.
	456	320	K	117		
	457 L.H.	320	K		117	
	458	310	K	117		
	459 L.F.	320	D		40	G.T.
	460	300	D	77		G.T.
	461 R.H.	290	D		77	G.T.
	462	350	D	44		G.T.
July 14, 1903. (27 days after inoculation.)	471 R.F.	300	K		133	Healthy.
	472	390	K	133		
	473 L.H.	290	K		133	Tuberculosis.
	474	350	K	133		Healthy.
	475 L.F.	340	D		60	G.T.
	476	350	D	31		G.T.
	477 R.H.	370	D		59	G.T.
	478	450	D	24		G.T.
July 28, 1903. (41 days after inoculation.)	487 R.F.	280	D		38	G.T.
	488	230	D	42		G.T.
	489 L.H.	250	K		119	Tuberculosis.
	490	280	K	119		Healthy.
	491 L.F.	310	D		49	G.T.
	492	370	D	21		Slight Tuberculosis.
	493 R.H.	300	D		7	Acute Infection.
	494	300	D	25		G.T.
August 5, 1903. (49 days after inoculation.)	522 L.H.	380	D		112	G.T.
	523	440	D	70		G.T.
	524 R.F.	320	D		85	G.T.
	525	350	D	68		G.T.
	526 L.F.	440	D		17	Slight Tuberculosis.
	527	370	D	17		
	528 R.H.	705	D		17	
	529	420	D	17		

CALF 210. (Bull.)

Subcutaneous inoculation of culture derived from the original material of Virus B. III.

Dose—0·02 milligramme.

Date—September 12th, 1904.

Weight—0 cwt. 3 qrs. 26 lbs.

Killed—January 23rd, 1905. 133 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 12th, 1904.

Eleven days after inoculation there was a flattened pear-shaped tumour 2½ in. by 1½ in; the prescapular gland was slightly enlarged. The tumour and gland increased in size, and on September 28th attained their maxima, 3 in. by 2 in. by 1 in., and 3 in. in length, respectively; extending from the tumour to the prescapular gland a thick cord was felt.

After remaining stationary in size for a month or so the tumour began to diminish, and finally assumed a somewhat globular shape. The gland began to diminish in size later than the tumour, and on January 12th, 1906, measured about 2 in. in length.

The calf remained in perfectly good health throughout the experiment, but did not grow quite at the normal rate.

Tuberculin Test.

December 11th, 1904. 95 days after inoculation. Positive. Rise of temperature, 1·8° C.

Weight.

During the first fortnight there was a gain in weight of 14 lbs.; in the next fortnight the animal lost 12 lbs. Subsequently there was a slow but steady progressive increase in weight.

	cwt.	qrs.	lbs.
September 13th, 1904 - -	0	3	26
September 27th, 1904 - -	1	0	12
October 11th, 1904 - -	1	0	0
January 23rd, 1905 - -	1	1	25
Gain in weight, - -		1	27
Rate of gain per week -			2·9

Temperature.

The temperature during the first fortnight was normal; then for about three weeks it was a little irregular, but never rose above 39·6° C. During the remaining period of the experiment the temperature was generally normal or below normal, and never rose higher than 39·6° C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Seat of Inoculation.—In the subcutaneous tissues at the seat of inoculation, on the left side of the neck, there was a fibrous nodule 1 in. by 1 in. by ½ in., containing in the centre an oval cavity 1 cm. in length, filled with viscid tenacious caseo-pus. The skin over it was thoroughly adherent and greatly thickened. Extending from the posterior margin of the tumour a short distance towards the prescapular gland there was a thickened lymphatic vessel containing softened caseous nodules.

Left Prescapular Gland.—Measured 1¾ in. by 1¼ in. by 2½ in. On section in the middle of the gland there was an oval caseo-calcareous mass 1 in. in length; the cortex of the gland was studded with yellow highly calcareous tubercles.

Right Prescapular Gland.—1½ in. by ¾ in. by ½ in. Normal.

Prepectoral Glands.—On the left side the rounded prepectoral gland was the size of a small marble. On section it was dense and caseous, and showed at one part a calcareous patch. Other prepectoral glands on this side were normal.

Cervical Glands.—The superior cervical gland on the left side, the size of a broad bean, resembled the rounded prepectoral gland. Other cervical glands were normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Spleen.—5 ozs. Normal on the surface; showed on section from six to eight calcareous tubercles, the size of pins' heads.

Liver.—Showed in the substance, under the capsule, two grey miliary tubercles, calcareous in the centre: one similar tubercle was seen in the depth.

Gall Bladder.—Normal.

Portal Glands.—Were little, if at all, enlarged. They contained in the cortices numerous calcareous nodules, irregular in outline, the largest about 3 mm. in diameter.

Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Diaphragm, Pleura.—Normal.

Lungs.—Were normal in colour and texture: the parenchyma contained a considerable number of little grey tubercles scattered moderately evenly throughout: each tubercle had a minute calcareous centre: there were besides a few larger tubercles up to the size of a wheat grain.

Thoracic Glands.—The caudal mediastinal gland appeared a little enlarged (2 in. by 1 in. by ⅔ in.). On section the cortex showed numerous irregular calcareous nodules and discrete calcareous foci.

The glands in front of the caudal gland, and the bronchial glands, were similarly affected.

A gland below the trachea was slightly enlarged, and contained two pea-sized caseous nodules in process of softening, as well as a number of calcareous nodules.

The right peribronchial resembled the bronchial. Ventral mediastinal glands normal.

Alimentary Tract :

Tonsils, Pharynx.—Normal.

Intestines.—A Peyer's patch near the anterior end of the intestine and one in the jejunum, each contained a firm translucent sub-mucous tubercle. A patch about the beginning of the ileum showed a softened caseous tubercle.

In the long Peyer's patch there were four ulcers in the mucous membrane: these varied from 5 to 8 mm. in diameter, and had slightly raised thickened edges: the bases were not thickened, but showed here and there a minute yellow point. There was one similar ulcer in the patch just in front of the lung patch.

Large intestine normal.

Gastric Glands.—Normal.

Mesenteric Glands.—Contained eight widely-distributed calcareous tubercles and a few calcareous grains.

Ileo-Colic Glands.—Contained irregular calcareo-caseous nodules.

Colic Glands.—One colic gland was similarly affected.

Testicles.—Normal.

Various Lymphatic Glands :—

Cœliac.—One coeliac gland contained a pea-sized calcareo-caseous nodule and a small calcareous tubercle.

Renal.—The renal gland showed a series of yellow calcareous foci.

Pudic.—A pudic gland contained two calcareous tubercles.

Sacro-Iliac.—The sacro-iliac gland contained two pin-head-sized yellow calcareous tubercles.

Pharyngeal.—The pharyngeal glands each contained a similar tubercle.

Ischiatic, Popliteal, Iliac, Lumbar, Axillary, Right Prepectoral, Parotid, Submaxillary.—Normal.

Microscopical Examination (Smear Preparations).

Right Pharyngeal Gland.—A few tubercle bacilli.

Intestine } No tubercle bacilli.
Spleen. }

CALF 214. (Bull.)

Subcutaneous inoculation of culture from the original material of Virus B. III.

Dose—50 milligrammes.

Date—September 12th, 1904.

Age—8 weeks.

Killed—When dying. October 27th, 1904. 45 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 27th, 1904.

Eleven days after inoculation there was a moderately thick patch of infiltration measuring 7 in. from above downwards and 3 in. in breadth; the upper part was firm, the lower softer and œdematous; the swelling was hot and tender. The prescapular gland was much enlarged and measured 5 in. in length. The animal already showed signs of illness; the coat was rough, and the motions very loose. On September 28th, 16 days after inoculation, there was a very large tumour, measuring in superficial area 8½ in. by 4½ in., which completely covered a greatly enlarged prescapular gland.

The tumour became still larger, and measured on October 20th, 35 days after inoculation, 11 in. by 6 in. by 3 or 4 in; it was firmly adherent to the skin and muscles, both of which were infiltrated.

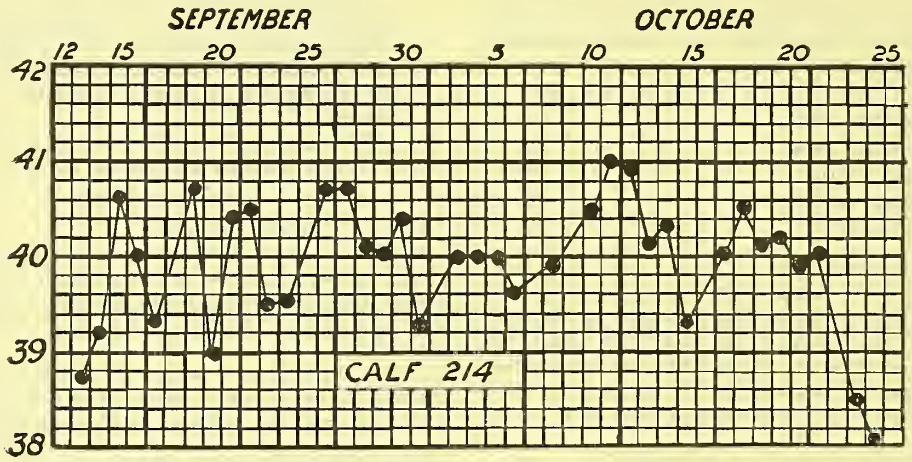
On October 13th, 31 days after inoculation, the respirations were noticed to be increased; the appetite was poorer, and the animal seemed to be losing flesh. The respirations became quicker, but were never very rapid; during the last few days of life these were laboured and jerky. The calf gradually became thinner and weaker, and for two days before its death was unable to rise from the ground.

Weights.

During the last 16 days the calf lost 33 lbs., an average of 14·4 lbs. per week.

	cwt.	qrs.	lbs.
September 19th, 1904 - - -	1	0	19
October 11th, 1904 - - -	1	0	22
October 27th, 1904 - - -	0	3	17
Loss in weight from September 19th -			30

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a large prominent tumour extending from the level of the roots of the vertebral spines into the dewlap. The length of the tumour from above downwards was 11 in., and from side to side 5½ in. When removed it weighed with the skin to which it was adherent, 2 lbs. 2 ozs. For description it may conveniently be divided into two parts, a superior oval-shaped part 7 in. in length, 5½ in. in breadth, and about 2¼ in. in thickness; and an inferior tongue-shaped part 4 in. long, 3 in. wide at the base, and ¾ in. in greatest thickness. On section the upper part of the tumour consisted for the most part of dense pinkish yellow tissue, which in the centre was showing signs of breaking down, *i.e.*, was softer, and contained little spaces filled with clear fluid. The skin was scaly and thoroughly adherent to the growth; over the middle portion it was infiltrated throughout its whole thickness, but was not ulcerated. The growth involved also the whole thickness of the superficial muscles, and here it showed large caseous nodules surrounded either by dense white fibrous tissue or fibroid muscular tissue. The deeper portions of the tumour partially surrounded the prescapular gland, and were intimately adherent to its capsule.

The tongue-shaped extension of the tumour consisted of compact pinkish yellow caseated tissue similar to that in the upper part; both the skin and the muscles were adherent to it, but neither was infiltrated.

The tissues around the tumour and prescapular gland were moderately œdematous.

Left Prescapular Gland.—Weighed 10 ozs., and measured 3⅜ in. by 2⅓ in. by 2¼ in.; on section it consisted throughout of firm pinkish yellow tissue, resembling that in the local tumour; close inspection showed more opaque yellow points and streaks scattered throughout; in the medullary part there were closely aggregated caseous tubercles; the capsule was greatly thickened, and contained a few isolated yellow tubercles.

Prepectoral Glands.—No. I.—Hard, spherical, and about an inch in diameter, caseous throughout, the central part being compact and pinkish yellow in colour, the margins opaque yellow; the marginal part was separated from the central part by a distinct line of demarcation.

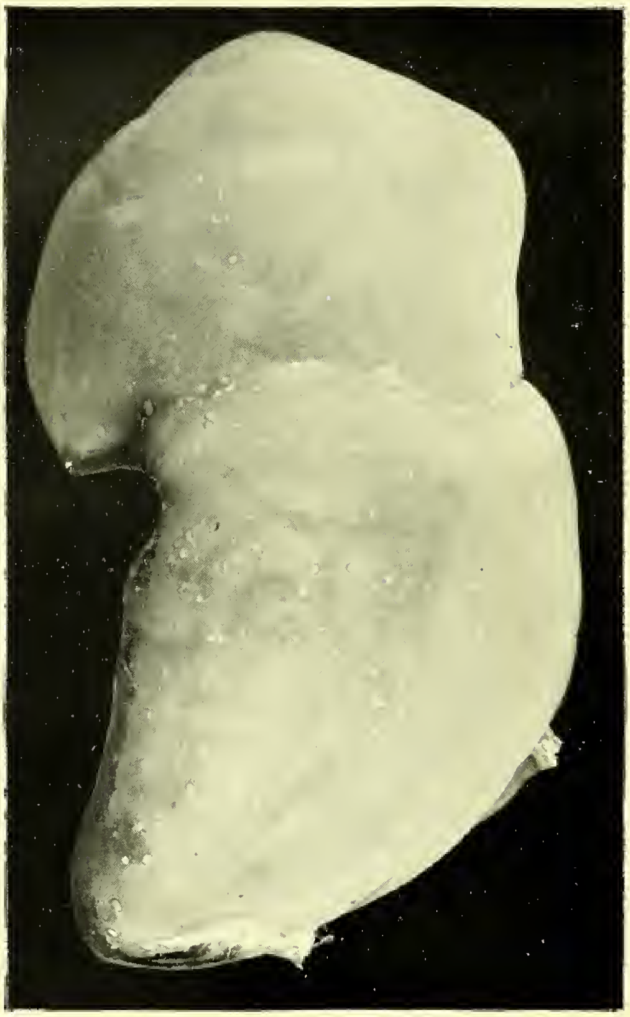
No. II.—Kidney-shaped: 1½ in. long; showed in the cortex caseating masses and discrete caseous foci.

No. III.—Size of large pea; contained caseating nodules.

Both the latter glands were œdematous.

Abdomen:

Omentum.—The inferior surface of the omentum showed numerous firm nodules, ranging from 2 to 5 mm. in diameter; some were loosely pedunculated and hæmorrhagic; others were attached by a broad base. On section they were dense and yellow in the centre, translucent around the margins. In addition to the large nodules there were numerous pearly translucent tubercles the size of mustard seeds.



CALF 214. Subcutaneous. Virus B. III.
Liver.

The parietal peritoneum was normal.

There were a few ounces of clear serous fluid in the peritoneal sac.

The serous surfaces of the stomachs were normal.

Spleen.—Weighed 12 ozs. Capsule normal; substance packed with firm yellow caseating nodules, the largest about 2·5 mm. in diameter. Here and there the nodules were grouped so closely together as to be facetted by their neighbours; they showed no sign of calcification.

Liver.—3 lbs. 11 ozs. (with glands). Normal in colour; showed on the surface numerous nodules ranging from 1 to 3 mm. in diameter; some of the larger nodules caused slight projections beneath the capsule; all were opaque in the centre, the larger ones being definitely yellow.

On section similar nodules were scattered throughout the substance; there was a preponderance of those tubercles which were a millimetre or less in diameter.

Gall Bladder.—In the mucous membrane there were four small ulcerated areas with congested margins and caseous bile-stained floor.

Portal Glands.—Were greatly enlarged, together weighing 4 ozs.; on section they were closely beset with caseating nodules, which formed practically continuous tuberculous masses throughout the cortex; the tissue of the glands was very œdematous.

Coeliac Glands.—Two coeliac glands were also much enlarged, and showed in their cortices similar confluent caseating tuberculous nodules.

Kidneys.—The left kidney showed in the cortex sparsely scattered caseous tubercles, the largest the size of a No. 4 shot. Some of those immediately beneath the capsule projected on the surface; the tubercles did not appear to be so numerous in the deeper parts of the cortex as in the superficial.

Similar tubercles were seen in the right kidney.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Beneath the pericardium of the right auricle there was a pinhead-sized caseating tubercle.

Heart muscle and valves normal.

Pericardium.—On the pericardium covering the left pulmonary artery there was a pea-sized loosely attached caseating nodule.

Lungs.—The lungs weighed 4 lbs. 12 ozs. The surfaces had a mottled appearance, areas of crepitant lung tissue (terra-cotta coloured) alternating with dark and collapsed areas.

Fairly evenly distributed throughout the substance of the lungs were numerous nodules, yellow and caseous in the centre, ranging in size from 1 to 2 up to 5 mm. in diameter; the majority of the nodules were surrounded by reddish areas of consolidation, and for the most part remained discrete; except on the dorsal surfaces of the caudal lobes the nodules near the surface caused slight projections beneath the pleura.

The fringes around the margins of the cephalic lobes contained a few small tubercles.

Mediastinal Glands.—The caudal mediastinal gland weighed 5 ozs., and measured 6 in. by 2 in. by 1 in.; on section the cortex showed throughout firm pinkish translucent tissue surrounding irregular yellow caseous islands of various sizes.

Anterior to the caudal gland there were three glands, the largest 1¼ in. long, which on section resembled the caudal gland, but were not quite so advanced in caseation; the gland tissue was very œdematous.

Still further forwards, *i.e.*, in the anterior part of the dorsal mediastinum, there were three large glands, which on section closely resembled the caudal gland. The dorsal mediastinal glands together weighed 7 ozs.

Bronchial Glands.—The saddle-shaped left bronchial gland weighed about 2 ozs.; the right bronchial measured 1¾ in. by 1¼ in. by ½ in.; both were tuberculous throughout and extensively necrosed.

The peribronchial glands were similarly affected.

Near the left bronchial gland there were two small œdematous glands which contained small caseating nodules.

Below the trachea, in front of the heart, there were three or four similar glands.

Just within the entrance to the thorax, on the left side, there was a large hard gland measuring 1¾ in. by 1½ in. by 1 in., and weighing about an ounce; on section dense, firm and caseo-necrotic throughout; capsule much thickened.

Near this gland there was a small œdematous gland, containing two pea-sized caseous nodules in the cortex.

On the right side there were two glands similar to the latter.

The glands in the ventral mediastinum (lying on the sternum) were slightly enlarged, and contained caseating nodules.

Pleura.—The fringes along the margins of the ribs were not hypertrophied, but showed here and there little groups of transparent granules, which could just be felt with the finger. The parietal pleura showed also three loosely attached nodules each the size of a split pea.

Diaphragm.—On the pleural surface of the central tendon of the diaphragm there were two similar nodules; around the margins of the tendon on the right side the fringes showed small transparent granules as on the ribs.

The caval fold of pleura presented numerous opaque foci.

Tongue.—On the right side of the tongue, near the root, the mucous membrane showed two caseous nodules, 2 m.m. in diameter, one of which was ulcerated.

In a corresponding position on the left side there was one ulcerated nodule.

The mucous membrane between the epiglottis and the base of the tongue showed four caseous nodules, one of which was ulcerated.

Palate.—On the under surface of the soft palate there were two pinhead-sized caseating nodules.

Tonsils.—Each tonsil contained several caseating nodules.

Thyroid.—The thyroid body was normal.

Larynx.—The mucous membrane of the larynx, in the thyroid angle, showed a caseous tubercle.

Intestines.—In the jejunum and duodenum there were sparsely-scattered pinhead-sized caseous tubercles beneath the mucuous membrane and in Peyer's patches; in the ileum they were much more numerous; on the serous surface two or three tubercles were seen.

The mucuous membrane of the large intestine, particularly of the cæcum, was closely studded with slightly raised congested nodules (enlarged solitary follicles), showing minute central openings and caseous centres.

Gastric Glands.—Were enlarged, their cortices being crowded with caseating nodules.

Mesenteric Glands.—Were all much enlarged and extremely œdematous; those in the anterior two thirds contained isolated caseous nodules, whilst those in the posterior third were closely beset with nodules.

Ileo-Colic Glands, Colic Glands.—Were all very enlarged and extensively tuberculous, caseating tuberculous masses occupying practically the whole of the cortices.

Various lymphatic glands:

All the undermentioned glands contained in their cortices numerous caseating nodules, ranging from 2 to 3 mm. in diameter:

> *Lumbar*, *Ilio-Sacral*, *Iliac* (nodules not so numerous as in the lumbar), *Renal*, *Pudic*, *Precrural*, *Popliteal*, *Gluteal*, *Ischiatic* (nodules small), *Axillary*, *Right Prescapular*, *Right Prepectoral*, *Cervical*, *Sublingual*, *Vertebral*.

In the *Parotid*, *Submaxillary*, *Retro pharyngeal* and *Hyoid* glands the nodules were larger, some being over 5 mm. in diameter.

The pharyngeal and submaxillary glands were intensely congested.

Many hæmo-lymph glands contained caseating nodules.

Testicles, Thyroid Body, Brain.—Were normal.

Microscopical Examination.

Smears from :

Gall Bladder—A few tubercle bacilli.

Tongue Nodule.—Four tubercle bacilli.

Kidney - *Laryngeal Nodule* - *Auricle* -	Moderate number of tubercle bacilli.

Omentum.—Three tubercle bacilli.

Post-Pharyngeal Gland - *Intestine* - *Tonsil,* - *Hæmo-Lymph Gland* - *Prepectoral Gland (Emulsion)*	Numerous tubercle bacilli.

Precrural Gland.—A few tubercle bacilli.

Guinea-Pigs Inoculated.

Guinea-pig 1321, inocluated intraperitoneally, and Guinea-pig 1320 inoculated subcutaneously, with an emulsion made from the left prepectoral gland, died of general tuberculosis in 22 and 78 days respectively.

CALF 248. (Bull.)

Subcutaneous inoculation of culture obtained from Calf 214.

Dose—50 milligrammes.

Date—March 23rd, 1905.

Age—13 weeks.

Died—May 8th, 1905. 46 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side the neck on March 23rd, 1905.

A week after inoculation there was a firm infiltrating mour measuring 4 in. by 2¼ in. by 1 in.; the left pre-apular gland was about 3 in. in length.

On April 11th, 19 days after inoculation, the tumour as prominent, firm, and pear-shaped in outline, and easured 6 in. by 3½ in. in superficial area; the prescapular and was 5 in. in length, and the spherical prepectoral and could just be felt.

The tumour increased still further, and on April 19th, 7 days after inoculation, measured 7 in. by 3½ in.; the epectoral gland was the size of a marble; the coat was ugh, but beyond this there were, up to this time, no gns of ill-health.

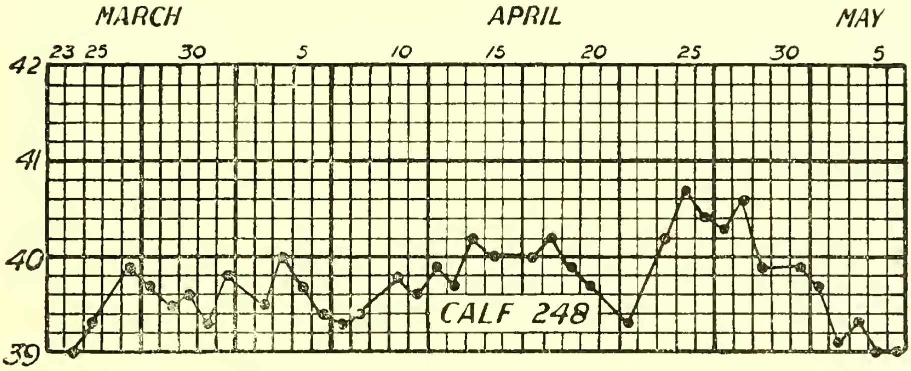
On April 28th the respirations were visibly increased, and the animal appeared to be losing flesh. It then rapidly got worse, the respirations continued to increase in frequency, and were finally laboured and jerky. During the last fortnight there was marked loss in flesh, and the animal became very weak, being scarcely able, for two or three days before death, to rise from the ground.

Weights.

During the first part of the experiment there was a gain in weight. From April 19th to May 8th the calf lost 1 qr. 6 lbs.

	cwt.	qrs.	lbs.
March 28th, 1905 - - -	0	3	21
April 19th, 1905 - - -	1	0	4
May 8th, 1905 - - -	0	2	26
Loss in weight from March 28th to May 8th - -	0	0	23

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—In the subcutaneous tissues on the left de of the neck there was an elongated tumour, which easured 6¾ in. vertically, 3 in. from before backwards, nd about 1½ in. in greatest thickness; the inferior portion pered gradually, terminating in the loose tissues of the eck under the trachea. The tumour was composed of ense yellow caseo-necrotic tissue, which enclosed in the pper half an irregular cavity filled with clear serous fluid: e internal walls of the cavity were shreddy, soft and ecrotic. The skin was thoroughly adherent and slightly ickened, and beset with small congested caseous tuberles. The muscles, chiefly under the upper half of the umour, were dense, fibroid, and infiltrated with caseous odules of various sizes for a depth of ½ in.

In the course of the lymphatic vessels leading to the preectoral glands there were some pea-sized caseous nodules.

Left Prescapular Gland.—Weighed 4 ozs., and measured ½ in. by 2¼ by 1½ in. On section it consisted throughut of dense pink sh-yellow caseated tissue, which showed ere and there opaque whitish streaks and foci of beginning calcification; the capsule was thickened.

Prepectoral Glands.—The rounded prepectoral gland was nlarged, œdematous and deeply congested. In the cortex here were numerous opaque caseous foci. The kidney-haped gland and a small deeper gland contained discrete aseating nodules.

Cervical Glands.—A gland in the middle of the neck n the left side, the size of a large pea, was yellow and aseous throughout; a left upper cervical gland showed alf its substance occupied by a yellow caseous mass, and n the rest discrete caseating nodules. Other cervical lands on the left side, and those on the right, were a ittle enlarged, and contained discrete caseating nodules.

Abdomen:

Omentum.—On the inferior surface of the omentum there were numerous flattened lenticular caseating nodules, the largest about 5 mm. in diameter; most of the nodules were loosely attached, and many were deeply hæmorrhagic; they were most numerous near the line of attachment of the omentum to the rumen.

On the small omentum there were numerous pinhead-sized tubercles and one or two nodules.

There were two lenticular nodules on the parietal peritoneum, near the left margin of the ribs.

Spleen.—Not apparently enlarged; weighed 10 ozs. On section there were fairly numerous yellow caseous tubercles, ranging from 1·5 to 2 or 2·5 mm. in diameter.

Kidneys.—Left kidney showed on the surface about ten grey tubercles the size of millet seeds, slightly opaque in the centre. On section similar tubercles were sparsely scattered throughout the depth of the cortex.

The right kidney contained about the same number of tubercles as the left, but some of these were about twice as large.

Suprarenal Bodies.—Normal.

Liver.—Substance was firm, normal in colour. Scattered evenly over the surface there was a moderate number of flattened slightly raised "mushroomed" caseating nodules, the largest about 4 mm. in diameter: on the posterior surface the nodules were more rounded than on the anterior. On section tubercles ranging in size from a point just visible to about 1·5 mm. in diameter were seen throughout the liver substance (the tubercles were much less numerous than is usual in more acute cases).

Gall Bladder.—Showed three submucous caseous tubercles, one of which was ulcerated.

Portal Glands.—Were much enlarged, indurated and consisted practically throughout of confluent caseating nodules and masses.

Thorax :

Heart, Pericardium.—Normal.

Pleura.—The fringes along the margins of the ribs were congested, and in places slightly hypertrophied ; they contained a few small grey tubercles ; there were also two or three lenticular nodules similar to those on the omentum.

There were a few similar nodules and small tubercles on the dorsal mediastinal pleura, and on the pleura covering the pericardium. On the pleura covering the diaphragm there were fairly numerous flattened nodules, the largest 5 mm. in diameter.

Lungs.—The cephalic lobes, the right middle lobe, and the thin antero-ventral portions of the caudal lobes, were extensively consolidated ; they were not completely airless, the dorsal border showed only here and there a collapsed lobule, whilst in the more solid parts there was seen an occasional small air-containing lobule. In the caudal lobes irregular dark red solid patches were seen scattered throughout, surrounding groups of nodules. Some of these solid areas showed, besides the nodules, numerous minute grey foci.

The tissue of the lungs was moderately closely beset with caseating nodules, ranging in size from 1 to 2 or 3 mm. in diameter ; in the small anterior lobes these projected slightly under the pleura ; the larger nodules were irregular in outline, and not definitely circumscribed. The bronchi in the consolidated lobes were filled with muco-pus.

Mediastinal Glands.—The caudal mediastinal gland was much enlarged, and showed the cortex composed of firm grey tissue, beset with irregular yellow patches and foci of caseation.

The glands anterior to this, and the infra-tracheal glands, were enlarged and similarly affected.

Bronchial Glands.—Resembled the mediastinal, but were perhaps slightly more advanced in caseation.

The glands in the caval fold of pleura resembled the mediastinal, but were not so advanced.

Tonsils.—Contained numerous caseating nodules, some of which were softened.

The corrugated mucous membrane in the vault of the pharynx was studded with caseous nodules, and almost all the lymphoid follicles at the sides and base of the tongue were enlarged and caseating.

Larynx.—On the laryngeal surface of the epiglottis there was a shot-sized tubercle.

Trachea.—Filled with white froth. The mucous membrane showed a number of small, congested, ulcerated, caseous areas, slightly elevated above the surface.

Intestines.—The long Peyer's patch was exceptionally closely beset with caseous nodules up to 2 mm. in diameter ; they were moderately numerous in the rest of the small intestine.

All the solitary follicles in the large intestine were enlarged and caseating.

Mesenteric Glands.—The glands at each extremity, particularly the posterior, were moderately enlarged and their cortices consisted throughout of firm grey tissue, penetrated with a yellow caseous network. The glands in the middle of the mesentery contained more or less discrete caseating nodules.

Gastric Glands, Colic Glands.—Resembled the terminal mesenteric.

Various Lymphatic Glands :

Cœliac.—Were enlarged, firm, and composed of pinkish translucent tissue, which surrounded irregular yellow caseous patches.

Lumbar, Renal.—Were slightly less affected than the cœliac.

Ischiatic, Gluteal, Popliteal, Precrural, Iliac, Ilio-Sacral. Pudic, Right Prescapular, Right Prepectoral, Axillary, Ventral Mediastinal, Vertebral.—Were crammed with firm yellow caseous nodules, up to 3 and 4 mm. in diameter.

Submaxillary, Retropharyngeal, Parotid.—Were enlarged, and packed with confluent caseating nodules.

Most of the hæmo-lymph glands contained caseous nodules.

Bladder.—Normal.

Testicles.—One testicle contained a caseous tubercle.

Eyes.—Normal.

Microscopical Examination.

Colon.—Very numerous tubercle bacilli.

Gall Bladder
Tongue } Moderately numerous tubercle bacilli.
Testicle

VIRUS B IV.

July 29, 1903.

MESENTERIC GLANDS.

The glands were obtained from a cow which had lesions of the pharyngeal glands and foci of tuberculous broncho-pneumonia in the lungs. The mesenteric glands were slightly enlarged and contained caseo-calcareous masses.

TABLE 4.

VIRUS B IV.

(July 29, 1903.)

MESENTERIC GLANDS.

CALF 118 [Age, 8 weeks].
Subcut.
Dose : 11,156,200 T.B.
Killed, November 7, 1903.
(100 days.)

P.M.—Small caseo-calcareous tumour : adjoining glands tuberculous ; one tubercle in liver and one in spleen ; slight tuberculosis of lungs and thoracic glands.

GUINEA-PIGS from prescapular gland.

683	270	Died.	56 days.	G. T.	S.
684	360	,,	52 ,,	G. T.	S.
685	380	,,	39 ,,	G. T.	I.
686	310	,,	42 ,,	G. T.	I.

CALF 120 [Age, 8 weeks].
Subcut.
Dose : 11,156,200 T.B.
Killed, October 30th, 1903
(92 days.)

P.M.—Small caseo-calcareous lesion ; neighbouring glands caseous and calcareous ; slight tuberculosis of spleen, liver, and peritoneum ; scattered calcareous tubercles in both lungs ; left popliteal and a mesenteric gland affected.

GUINEA-PIGS.

Dose=1,014,200 T.B.	503	290	Died.	63 days.	G. T.	S.
	504	290	,,	90 ,,	G. T.	S.
	505	250	,,	59 ,,	G. T.	I.
	506	250	,,	66 ,,	G. T.	I.

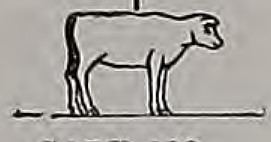
RABBITS.

Dose—1,014,200T.B.	2	990	Died.	140 days.	G. T.	S.
	3	1,000	,,	128 ,,	G. T.	S.
	4	920	Killed.	142 ,,	T.	S.
	5	1,050	Died.	78 ,,	G. T.	I.

Prescapular Gland.

CALF 140.
Subcut.
October 30, 1903—Dose : 100,000 T.B.
April 7 - 1904—Dose : 25 mg. culture.
June 23 - 1904—Dose : 50 mg. culture.
November 1, 1904—Dose : 1 mg. culture.
February 23, 1905—Dose : 100 mg. culture.
May 19 - 1905—Dose : 229 mg. culture.
(The culture used in each case was from the original material of Virus B IV.)
Killed, June 30, 1905, 609 days after the primary inoculation.

P.M.—Five caseous local lesions ; three small nodules in left prescapular and two in right precrural ; two caseous tubercles in the spleen ; four abscesses in the liver substance and a perlsucht growth on the capsule ; a few caseous nodules in the substance, and a few perlsucht growths on the surface of the lung. The thoracic and portal glands contained discrete caseous gritty tubercles.



CALF 138.
Subcut.
Dose : 1,500,000 T.B. in 10·8 c.c.
Killed, May 19, 1904.
(202 days).

P.M.—Small fibroid lesion : prescapular gland slightly enlarged containing calcareo-caseous substance ; nine small tubercles in the lungs, scattered tubercles in the thoracic glands, and one or two in portal glands.

GUINEA-PIGS.

Dose = 1,014,386 T.B.	664	330	Died.	52 days.	G. T.	S.
	665	370	,,	38 ,,	G. T.	I.
	666	350	,,	39 ,,	G. T.	I.
Dose = 100,000 T. B.	667	350	,,	52 ,,	G. T.	I.
	668	400	,,	140 ,,	G. T.	I.

E. of Local Tumour and Prescapular Gland.

COW 172.
Intramammary.
Dose : 14,670,000 T.B. into each of two quarters.
Killed, June 23, 1905.
(392 days.)

P.M.—Chronic tuberculosis of the udder and supramammary lymphatic glands ; the iliac glands contained a few yellow foci and each suprarenal body a caseo-calcareous tubercle ; there was no tuberculosis elsewhere.

GUINEA-PIGS.

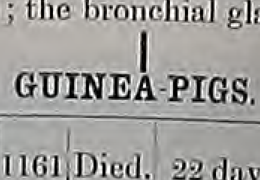
Bronchial gland	1009	Died.	24 days.	T.	I.
Portal gland	1010	Killed.	62 ,,	G. T.	I.
Emulsion of local tumour and prescapular gland.	1011	,,	27 ,,	T.	S.
	1012	,,	27 ,,	T.	I.
	1013	Died.	47 ,,	G. T.	I.

RABBITS.

50	Subcut.	Died.	122 days.	G. T.
51	Intrap.	Died.	124 ,,	G. T.

Emulsion of tuberculous organs of G.P.s 1011 and 1012.

Inoculated June 16, 1904.



COW 164.
Intramammary.
Dose : 14,600,000 T.B. into each of two quarters.
Killed, August 2, 1904 (dying).
(47 days).

P.M.—Tuberculosis of inoculated quarters, supramammary lymphatic glands and left precrural gland ; right precrural and iliac gland packed with tubercles ; liver, spleen, and kidneys showed minute tubercles ; lungs contained numerous opaque miliary tubercles ; the bronchial glands a few.

GUINEA-PIGS.

Spleen	1161	Died.	22 days.	G. T.	I.
	1162	,,	48 ,,	G. T.	S.

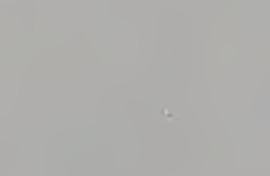
MILK.

GUINEA-PIGS 1148 & 1150.

DOG 26 (Adult).
Intraperitoneal.
Dose : 10,150,000 T.B.
Killed, very ill, November 3, 1904.
(71 days).

P.M.—Numerous caseous nodules in omentum : miliary tuberculosis of liver and lungs : portal, cœliac, lumbar and ventral mediastinal glands enlarged and caseating ; tuberculosis of right epididymis.

DOG 24 (Adult).
Subcutaneous.
Dose : 10,150,000 T.B.
Killed, well, February 11, 1905.
P.M. : No tuberculosis.



CALF 184.
Subcutaneous.
Dose : 1,500,000 T.B.
Killed, January 26, 1905.
(225 days).

P.M.—Caseous abscess : prescapular gland two-thirds caseous and softened : the spleen contained three, the liver ten, and the lungs fifteen caseous nodules ; several lymphatic glands were affected.

GUINEA-PIGS.

Dose : 1,467,000 T.B.	1059	Died.	36 days.	G. T.	S.
	1060	,,	21 ,,	G. T.	I.

VIRUS (B) IV.

TABLE 4 c.

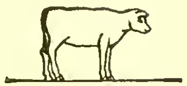
Culture Inoculation.

Virus of July 29, 1903.

MESENTERIC GLANDS.

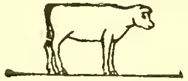
Animals inoculated with culture derived
from the original material.

April 7, 1904.
The culture used 42 days old, 6th generation
the total age of the culture was 292 days.

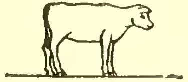


CALF 142.
Subcutaneous.
Dose : 12·5 mg.
Killed, dying, June 6, 1904
(60 days).
P.M.—General tuberculosis.

October 31, 1904.
The culture used 20 days old, 16th generation ; the total age of the culture was 460 days.



CALF 218.
Subcutaneous.
Dose : 46 mg.
Killed, very ill, December 2,
1904. (32 days).
P.M.—General tuberculosis.



CALF 220.
Subcutaneous.
Dose : 50 mg.
Died, December 6,
1904. (36 days).
P.M.—General tuberculosis.

CHIMPANZEE 4.
Subcutaneous.
Dose : 1·0 mg.
Died, December 26, 1904.
(55 days).
P.M.—Miliary tuberculosis.

PIG 94.
Subcutaneous.
Dose : 1 mg.
Killed, December 31, 1904.
(61 days).
P.M.—General tuberculosis.

BABOON 36.
Subcutaneous.
Dose : 1·0 mg.
Died, November 4, 1904.
(3 days).
P.M.—Nothing visible beyond
seat of inoculation.

December 14, 1904.

Culture 20 days old, 18th generation.

MANDRILL BABOON 46.
Subcutaneous.
Dose : 1·0 mg.
Died February 1, 1905.
(49 days.)

P.M.—Local abscess ; axillary glands caseous ; a few tubercles in liver and kidneys ; a moderate number in the lungs and numerous caseous nodules in the spleen ; several lymphatic glands affected.

Calf 118.

Subcutaneous Inoculation of 11 cubic centimetres of an emulsion made from the original material.

Number of Bacilli Inoculated—11,156,200.

Date—July 30th, 1903.

Age—8 weeks.

Weight—2 qrs. 25 lbs.

Killed—November 7th, 1903. 100 days after inoculation.

Clinical History.

The local lesion attained its maximum size (5 in. by 2¾ in.) about three weeks after inoculation, and was slightly raised and pear-shaped in outline; it then gradually dwindled in size and finally measured 3 in. by 2 in. by about ½ in.

The prescapular gland slowly enlarged until the end of the first month, when it measured 4¼ in. by 2½ in.; it then became smaller.

Temperature.

The temperature was slightly raised on the 7th and 8th days after inoculation (highest 39·6°C.), and again from the 20th to the 23rd (highest 40·0°C.).

During the rest of the experiment the temperature was normal, with the exception of a sharp rise on October 15th to 40·8°C.

This rise of temperature was accompanied by an attack of diarrhœa; otherwise there were no constitutional symptoms throughout the experiment.

Tuberculin Test.

October 21st, 1903. Positive. Rise of temperature, 1·8°C.

September 3rd, 1903. Positive. Rise of temperature, 0·9°C.

Weights.

The calf was weighed every week, and each week showed an increase in weight.

	qrs.	lbs.
July 31st, 1903	2	25
November 3rd, 1903	5	7
Gain in weight	2	10
Average weekly increase		4·86

POST-MORTEM EXAMINATION.

Carcass.—Condition moderately fat.

Local Lesion.—In the subcutaneous tissues in front of the left shoulder there was a flattened tumour, 3 in. by 2 in. by about ½ in. The skin over it was intact. When divided it was seen to be adherent to the aponeurosis of the muscle on which it lay, and to consist of fibroid tissue closely beset with firm yellow caseous nodules, appreciably calcareous. In the subcutaneous tissue at the lower end of the growth there was a collection of yellow calcareous nodules from 2 to 5 mm. in diameter. Two or three nodules were seen embedded in the muscle.

Left Prescapular Gland.—Weighed about 2 ozs., and measured 2¾ in. by 1½ in. by 1 in. On section it consisted throughout of dense greyish caseating tissue, gritty from calcification; the more calcareous parts had a slight yellow tinge.

Left Prepectoral Glands.—The superficial prepectoral gland on the same side (size of a French bean) showed several minute yellow gritty foci; two deeper prepectoral glands were normal.

Cervical Glands.—A gland on the left side of the trachea, in the middle of the neck, the size of a filbert, was entirely caseous and calcareous. The gland on the opposite side, the size of a pea, was unaffected.

Abdomen:

Omentum and Peritoneum.—Normal.

Spleen.—7 ozs. Normal on surface; contained in the parenchyma one yellow gritty tubercle 2 mm. in diameter.

Liver.—Weighed 3 lbs. 5 ozs. Surface normal. In the depth of the substance there was one pearly grey tubercle, with a caseous centre, the size of a millet seed.

Hepatic Lymphatic Glands.—In one of the hepatic glands there was a caseous and gritty tubercle 2·5 mm. in diameter. Three other glands normal.

Kidneys:

Right.—5 ozs. Normal on the surface and on section.

Left.—5 ozs. Normal on the surface and on section.

Suprarenal Bodies.—Normal.

Intestines.—Normal throughout.

Gastric, Mesenteric and Colic Glands.—Normal.

Thorax:

Lungs.—Sparsely scattered throughout the lungs were calcareous nodules, containing very little caseous material, ranging in size from 1·5 to 5 mm. in diameter. Most of the nodules were seen on the surface beneath the pleura; they had a grey translucent appearance. The largest one projected slightly, and was surrounded by a red congested zone. The total number was not more than twelve in each lung.

The long mediastinal gland was not obviously enlarged, and contained one yellow calcareous nodule 8 mm. in diameter.

The gland anterior to this contained two similar nodules 4 m.m. in diameter. A gland more anterior still showed about ten caseous and calcareous nodules. The two latter glands were distinctly enlarged.

Right and Left Bronchial Glands.—Were also slightly enlarged, and contained several caseous and calcareous nodules.

An anterior mediastinal gland on the left side (at the opening of the thorax) was enlarged to the size of a filbert, and was caseous and calcareous almost throughout.

The gland on the opposite side, the size of a large pea, showed no visible tubercle.

Costal and Diaphragmatic Pleura.—Normal.

Heart and Pericardium.—Normal.

Mammary Gland and Supramammary Lymphatic Glands.—Normal.

Uterus.—Normal.

Tongue, Pharynx, Larynx and Tonsils.—Normal.

Posterior Pharyngeal, Submaxillary and Parotid Glands.—Normal.

Various Lymphatic Glands:

Left Precrural.—Normal.

Two Right Precrural.—Normal.

Right and Left Popliteal.—Normal.

Right and Left Ischiatic.—Normal.

Right and Left Glutcal.—Normal.

Right and Left Iliac.—Normal.

Right and Left Lumbar.—Normal.

Right and Left Axillary.—Normal

Right Prescapular.—Normal.

Right Prepectoral.—Normal.

Microscopical Examination.

Smears from:

Emulsion (see below).—A few tubercle bacilli.

Lung.—No tubercle bacilli.

Liver.—One tubercle bacillus.

Hepatic Lymphatic Gland.—No tubercle bacilli.

Guinea-pigs Inoculated.

Four guinea-pigs inoculated with an emulsion made from the left prescapular gland died of general tuberculosis.

CALF 120.

Subcutaneous Inoculation of 11 cubic centimetres of an emulsion made from the original material.

Number of Tubercle Bacilli Inoculated—11,156,200.

Date—July 30th, 1903.

Age—8 weeks.

Weight—3 qrs. 5 lbs.

Killed—October 30th, 1903. 92 days after inoculation.

Clinical History.

Nineteen days after inoculation there was a raised tumour 3 in. by 1¼ in.; the prescapular gland was enlarged and measured about 2½ in. in long diameter.

The local tumour slowly increased in size, and on October 14th measured 5 in. by 3¼ in. by 2 in., and was prominent, firm and closely adherent to the skin. Subsequently the tumour diminished slightly in size. The prescapular gland increased in size until the end of the fifth week, when it was 5 in. in long diameter, and then became smaller.

The general condition of the calf was good throughout the experiment, and no signs of ill-health were observed

Temperature.

The temperature began to rise on the 21st day after inoculation, and there was some irregular fever for about a month (maximum, 40·4°C); during the remainder of the experiment the temperature was normal.

Weights.

	qrs.	lbs.
July 28th, 1903 - - - - - -	3	5
October 27th, 1903 - - - - -	5	10
Gain in weight - - - - -	2	5
Average weekly increase - -	0	4·7

Tuberculin Test.

October 21st, 1903. Positive. Rise of temperature 2·5°C.

POST-MORTEM EXAMINATION.

Condition.—Moderately good.

At the Seat of Inoculation.—There was a tumour 3½ in. by 2½ in. by 1¼ in.; the skin was intimately adherent, but not ulcerated.

On section the tumour was very fibroid and beset with nodules; in the centre the nodules were confluent, and formed small greyish-white masses containing opaque yellowish white foci; calcareous grains could be detected in the caseous areas, particularly in those around the margins of the mass; in other parts of the tumour the nodules were discrete, yellow and calcareous. The growth was adherent to the superficial muscle, in which were numerous nodules; those at the lower end of the tumour were grouped together to form little masses, which on section were pinkish and translucent, and showed caseous and calcareous foci.

Prolonged from these masses to the prepectoral glands there were thickened lymphatic vessels, which here and there presented caseous nodules.

The Left Prescapular Gland.—Measured 3½ in. by 2 in. by 1¾ in., and weighed 3 ozs. On section it consisted throughout of dense pinkish grey tissue, in which could be seen little opaque yellowish white foci; these foci contained minute calcareous grains; the capsule was very thickened.

Left Prepectoral Gland, into which the thickened lymphatic vessels were traced, was about the size and shape of a small walnut. On section the cortex was composed of dense tissue similar to that in the prescapular gland; the central parts were yellower and more calcareous.

A second gland close to the above, but more deeply placed, contained in the cortex about a dozen small caseous tubercles, gritty from calcification.

Left Axillary Gland—Normal.

Abdomen.

Peritoneum.—On the peritoneum covering the floor of the abdomen there was a number (30–40) of pearly translucent hemispherical tubercles from 1 to 4 mm. in diameter. Similar bodies were seen on the serous surface of the rumen.

The peritoneum along the margins of the diaphragm showed some delicate villous growths.

Spleen.—Weighed 9 ozs. Normal on the surface. The pulp contained six yellow nodules 3 to 4 mm. in diameter, slightly gritty from calcification.

Liver.—Weighed 3 lbs. 5 ozs. On the anterior surface were seen five nodules 3 to 5 mm. in diameter; one projected slightly, and its flattened surface was covered with a soft fibrous outgrowth; the others were embedded in the parenchyma. On section each had a dense translucent periphery and a yellowish calcareous centre. In the depth of the liver substance there were about half a dozen similar nodules.

Two of the hepatic lymphatic glands each contained a caseous tubercle the size of a No. 4 shot.

Kidneys.—Each weighed 8 ozs. and was normal on the surface and on section.

Suprarenal Bodies.—Normal.

Thorax.

Pleura—The pleura covering the upper half of the diaphragm presented a series of prominent soft reddish granulations half an inch broad; these were arranged along the margin of the muscle near its insertion into the tendon, and contained minute greyish points.

Similar granulations occurred along the margins of the last few ribs. Finer and paler granulations were seen along the margins of the anterior ribs and on the central tendon of the diaphragm.

The mediastinal pleura was covered with a thin layer of reddish granulations. Similar granulations were seen on the pericardium reflected over the great vessels.

On the left side there was a flattened, loosely pedunculated congested body half an inch in diameter, containing caseous areas. On the right side there was a caseous tubercle the size of a wheat grain, connected to the ribs by a strand of fibrous tissue nearly an inch long.

Lungs.—Uniformly scattered throughout the lungs was a number of greyish tubercles (about thirty-six in each) ranging in size from 2 mm. up to 5 mm. in diameter; all were yellow and calcareous in the central parts.

In addition there were three nodules, each about 1 cm. in diameter, one in the right cephalic lobe, and two in the left posterior lobe; each occupied part of a lobule and had softened gritty contents; one of the latter projected on the surface.

The fringes along the margins of the lungs were slightly hypertrophied but did not contain tubercles.

Thoracic Lymphatic Glands.—The long posterior mediastinal gland measured 4 in. by 1¼ in., and contained several calcareous masses and numerous small yellow calcareous tubercles.

Other mediastinal glands and the left bronchial gland were also enlarged, and contained numerous yellow gritty tubercles. The right bronchial gland, 1¼ in. by 1 in., was caseous and calcareous throughout.

Some small glands along the oesophagus showed little caseous gritty tubercles.

Ventral Mediastinal Glands.—Normal.

Heart, Muscle and Endocardium.—Normal.

Tongue.—Normal.

Larynx.—Normal.

Pharynx.—Normal

Tonsils.—Normal.

Intestines.—Normal throughout.

Mesenteric Glands.—A gland situated near the centre of the mesentary contained caseous, slightly gritty tubercle, 3 mm. in diameter.

Colic Glands
Gastric Glands } Normal.

Various Lympathic Glands:

Left Popliteal.—Contained a caseous, slightly gritty tubercle 2 mm. in diameter.

Right and Left Post-pharyngeal.—Normal.

Right and Left Submaxilliary.—Normal.

Right and Left Parotid.—Normal.

Right and Iliac.—Normal.

Right and Left Lumbar.—Normal.

Right and Left Gluteal.—Normal.

Right and Left Ischiatic.—Normal.

Left Precrural.—Normal.

Right Precrural
Right Prescapular } Enlarged, soft and œdematous (recent tuberculin test); no tuberculosis.

Miscroscopical Examination (*Smear Preparations*).

The Emulsion (*see below*).—Numerous tubercle bacilli.

Mesenteric Gland.—One tubercle bacillus.

Popliteal Gland.—No tubercle bacilli.

Liver.—A few tubercle bacilli.

Animals Inoculated.

Two calves (Nos. 138 and 140) and five guinea-pigs were inoculated with an emulsion made from the left prescapular gland.

All the Guinea-pigs died of general tuberculosis.

CALF 140.

This calf was inoculated subcutaneously on six different occasions ; the first inoculation was made with a tissue emulsion ; the rest with culture derived from the original material of Virus B. IV.

Primary Inoculation—October 30th, 1903. 0·72 cubic centimetres, containing 100,000 tubercle bacilli, of an emulsion made from the prescapular gland of Calf 120.

Second Inoculation—April 7th, 1904. 25 milligrammes of culture derived from the original material of Virus B. IV.

Third Inoculation—June 23rd, 1904. 50 milligrammes of culture derived from the original material of Virus B. IV.

Fourth Inoculation—November 1st, 1904. 1 milligramme of culture derived from the original material of Virus B. IV.

Fifth Inoculation—February 23rd, 1903. 100 milligrammes of culture derived from the original material of Virus B. IV.

Sixth Inoculation—May, 19th, 1905. 229 milligrammes of culture derived from the original material of Virus B. IV.

Killed—June 30th, 1905. 609 days after the primary inoculation.

Clinical History.

Primary Inoculation.

The calf was inoculated subcutaneously on the left side of the neck on October 30th, 1903 ; its age was fifteen and a half weeks.

A fortnight after inoculation there was a small subcutaneous thickening, the size of a French bean ; the prescapular gland was not appreciably enlarged. The local lesion gradually increased in size, and on November 30th, 31 days after inoculation, was of about the size and shape of a pigeon's egg ; the prescapular gland was indurated and enlarged, measuring 3 in. in long diameter. The tumour softened and then gradually dwindled in size ; towards the end of the experiment it was not larger than a broad bean ; the left prescapular gland also became much reduced in size. The general health of the animal was unaffected by this inoculation.

The temperature during the first 73 days was normal ; on the seventy-fourth day it rose to 39·5°C. and on the seventy-sixth to 40·3°C. ; it then fell and remained normal until the calf received the second inoculation.

Culture Inoculations.

On April 7th, 1904, 159 days after the first inoculation, the calf was inoculated on the right side of the neck with 25 mg. of culture derived from the original material of Virus B. IV. A hot, tender œdematous swelling developed at the seat of inoculation, which at the end of four days had grown to a very large size (10 in. by 4 in.) exending into the dewlap ; at the same time there was a period of high temperature (maximum 41·5° C.), with marked constitutional disturbance, lasting four days. The symptoms quickly abated, and the œdema slowly subsided ; a firm tumour remained, however, which subsequently diminished gradually in size and became softened and globular ; at the end of the experiment it was about the size of a hen's egg. The right prescapular gland enlarged and then diminished in size, but was for a long time felt to be distinctly larger than the left prescapular gland.

A control calf, No. 142, was inoculated at the same time as Calf 140 with 12·5 mg. of the same culture, *i.e.*, half he dose given to Calf 140 ; the animal was killed in a dying condition 60 days after inoculation and showed severe general tuberculosis.

On April 15th, 1904, 8 days, after the inoculation of culture, Calf 140 was tested with tuberculin, 1·5 cc. being noculated into the right flank. The temperature rose 2·6° C. and a flat œdematous local swelling developed. This test was performed to see whether the animal would react to tuberculin a short time after the intense reaction o the culture inoculation. A reaction was obtained to tuberculin not only on this occasion but also on three subsequent occasions, on April 18th, April 22nd, and April 26th, the temperature rising respectively 2·4, 1·7, and 2·3 degrees Centigrade ; on each occasion there was some local œdema, but there were no constitutional symptoms.

On June 2nd, 1904, 56 days after the last inoculation, the calf was inoculated in the subcutaneous tissues of the right flank with 50 mg. of culture derived from the original material of Virus B. IV.

Six hours after inoculation there was a tender, flattened œdematous swelling which at the end of 24 hours covered a larger area, but was not so prominent. The temperature began to rise six hours after inoculation and attained its maximum (41° C.) at the twelfth hour ; it then gradually fell, and three days later had returned to the normal.

The œdema gradually disappeared, but for a long time there was a slightly elevated circular swelling, 3 in. in diameter ; this softened, and on August 28th a small opening appeared in the skin through which thick caseopus was discharged. The right precrural gland became slightly enlarged and then slowly diminished in size.

Twenty-four hours after this second inoculation of culture a little of the œdema fluid was withdrawn from the centre of the swelling ; examined under the microscope it showed numerous tubercle bacilli and very few leucocytes ; many of the leucocytes, however, contained bacilli, some two or three, others large clumps, but most of the bacilli were unconnected with cells. On September 23rd, 1904, 113 days alter the inoculation, a guinea-pig was inoculated intraperitoneally with some of the pus discharged from the tumour ; the pus showed numerous well-stained tubercle bacilli, mostly in clumps, and no cellular elements ; the guinea-pig was killed 90 days after inoculation and showed a chronic form of general tuberculosis.

On October 4th, 7th, 20th, and 26th, 1904, the calf was tested with tuberculin ; on the first and last occasions there was a well-marked reaction ; on the second and third the temperature rose only slightly.

On November 1st, 1904, 152 days after the last inoculation, 1 mg. of culture from the original material of Virus B. IV. was inoculated beneath the skin of the left flank. On the next day there was a slight thickening which increased on the following day to a patch a little less than the palm of one's hand. This swelling gradually diminished in size, and at the termination of the experiment was felt merely as a slight subcutaneous thickening. There was no rise of temperature following this inoculation of culture, and the precrural gland was not perceptibly enlarged.

On November 15th, 1904, a fortnight after the last inoculation of culture, 3·0 cc. of tuberculin were inoculated subcutaneously ; the temperature rose 1·2° C.

On January 3rd, 1905, it was tested again with tuberculin a dose of 3·0 cc. being injected subcutaneously ; the temperature began to rise between the third and sixth hours and at the ninth hour registered 40·8 ; the maximum temperature preceding the test was 39° C. ; the temperature then fell and in twenty-four hours was normal.

On February 23rd, 1905, the calf was inoculated in the subcutaneous tissues of the right flank with 100 mg. of culture from the original material of Virus B. IV. Twelve hours afterwards the temperature rose to 40·4° C. (the maximum), and there were marked constitutional symptoms (increased respiration, loss of appetite, and rough coat). At the seat of inoculation 18 hours afterwards there was a slightly raised tender œdematous swelling which did not exceed in diameter the palm of one's hand ; on the next day the swelling was smaller and the symptoms had subsided ; the swelling continued to shrink and became very hard ; later on it underwent softening. The right precrural gland became distinctly enlarged.

Forty hours after the culture was inoculated a small quantity of œdema fluid was withdrawn from the centre of the swelling; smear preparations showed numerous tubercle bacilli, but very few cells, and in none of these could it be definitely said that bacilli were present. Eleven days after the inoculation of culture a syringe needle was pushed into the centre of the swelling and some shreddy fibrinous pus was withdrawn; this contained numerous tubercle bacilli, a good many of which were found inside leucocytes.

On May 19th, 1905, 85 days after the last inoculation of culture, 229 mg. of culture from the original material of Virus B. IV. were inoculated in the subcutaneous tissues of the left flank. The temperature rose to 40·9° C. 14 hours after inoculation, remained high for more than two days, and then fell to the normal.

At the seat of inoculation at the end of 24 hours there was a flat œdematous thickening; three days later there was fairly widespread œdema with very ill-defined margins; six days after inoculation there was a slightly raised hard flat tumour, measuring about 6 in. by 4 in., which subsequently slowly diminished in size.

The temperature in the intervals between the reactions produced by the inoculation of culture and tuberculin preserved an almost uniformly normal level. On two occasions only, May 8th–9th and July 22nd–25th, 1904, just before and after the second inoculation of culture was there any marked pyrexia, the highest temperature recorded on these occasions being 40·3 and 40·5° C.

List of Culture and Tuberculin Inoculations.

April 7th, 1904. 25 mg. culture. Rise of temperature 2·6° C.
April 15th, 1904. 1·5 cc. tuberculin. Rise of temperature 2·6° C.
April 18th, 1904. 1·5 cc. tuberculin. Rise of temperature 2·4° C.
April 22nd, 1904. 1·5 cc. tuberculin. Rise of temperature 1·7° C.
April 26th, 1904. 1·5 cc. tuberculin. Rise of temperature 2·3° C.
June 22nd, 1904. 50 mg. culture. Rise of temperature 2·1° C.
October 4th, 1904. 1·5 cc. tuberculin. Rise of temperature 1·6° C.
October 7th, 1904. 2·0 cc. tuberculin. Rise of temperature 0·9° C.
October 20th, 1904. 2·0 cc. tuberculin. Rise of temperature 0·5° C.
October 26th, 1904. 2·0 cc. tuberculin. Rise of temperature 1·7° C.
November 2nd, 1904. 1·0 mg. culture. No rise of temperature.
November 15th, 1904. 3·0 cc. tuberculin. Rise of temperature 1·6° C.
January 3rd, 1905. 3·0 cc. tuberculin. Rise of temperature 1·8° C.
February 23rd, 1905. 100 mg. culture. Rise of temperature 1·4° C.
May 19th, 1905. 229 mg. culture. Rise of temperature 2·0° C.

Weights.

From the beginning of the experiment up to July 19th, 1904, there was practically a steady increase in weight. From July 19th, 1904, to August 16th, 1904, the calf lost 2 qrs. 4 lbs.; from August 16th to 23rd, 1904, there was a gain in weight of 28 lbs.; then until September 20th, 1904, the weight was more or less stationary. During this time the animal became perceptibly thinner and seemed to be losing ground; he picked up, however, and from September 20th, 1904, until the end of the experiment showed a steady progressive increase in weight.

	cwts.	qrs.	lbs.
November 3rd, 1903 - -	1	1	13
July 19th, 1904 - - -	3	3	21
August 16th, 1904 - -	3	1	17
August 23rd, 1904- - -	3	2	17
September 20, 1904 - -	3	2	14
June 29th, 1905 - - -	7	0	12
Gain in weight during the experiment - - -	5	2	27
Rate of gain per week -	0	0	10·85

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

On the left side of the neck at the site of the inoculation of the tissue emulsion there was a cyst a little larger than a sparrow's egg, with fibrous walls, lined internally with brownish granulation tissue, and yellow gritty caseo-purulent contents.

The left prescapular gland measured $2\frac{1}{4}$ in. by 1 in. by about $\frac{3}{4}$ in.; on section towards one extremity there was a nodule the size of a swallow's egg, composed of thick gritty caseo-pus surrounded by a thin fibrous wall; the cortex of the gland between this nodule and the capsule was replaced by cicatricial fibrous tissue which caused a puckering of the surface. The cortex at the opposite extremity of the gland contained two small tubercles with soft yellow centres and fibrous margins.

At the site of the first inoculation of culture on the right side of the neck there was a tumour the size of a pigeon's egg, which on section was found to be a cyst with very thick fibrous walls and thick yellow gritty purulent contents; the cyst was lined internally with a layer of congested granulation tissue.

The right prescapular gland measured $2\frac{3}{4}$ in. by $1\frac{1}{4}$ in. by $\frac{1}{2}$ in.; on section the tissue was firm but no tubercles were seen.

The prepectoral glands on both sides appeared normal.

In the subcutaneous tissues of the left flank there was a nodule, the size of a filbert (third inoculation of culture), composed of brownish translucent tissue containing small cavities filled with thin brownish, yellow, slightly gritty caseo-pus.

A little in front of the latter, at the site of the fourth inoculation of culture, there was a tumour consisting of two parts which communicated one with the other by a short canal; the larger portion measured 3 in. by $2\frac{1}{2}$ in. by 1 in., and showed on section in the centre irregular caseo-necrotic masses bathed in yellow caseo-pus and around the margins a thick layer of fibrous tissue; the smaller portion measured $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. by a little over $\frac{1}{2}$ in.; this on section resembled the larger portion.

The left precrural gland measured 3 in. by $1\frac{1}{4}$ in. by $\frac{2}{3}$ in.; on section there seemed to be an increase in interstitial connective tissue, but no tubercles were seen.

In the subcutaneous tissues of the right flank there was a tumour 2 in. by $1\frac{1}{2}$ in. by $\frac{3}{4}$ in. (second culture inoculation), which on section was found to be a cyst with yellowish-brown gritty caseo-purulent contents and dense fibrous walls; the latter were lined internally with pale granulation tissue. The other lesion on the right was overlooked.

The right precrural gland measured 3 in. by 1 in. by a little over $\frac{1}{2}$ in.; on section at one extremity under the capsule there was a soft yellow tubercle the size of a pin's head; in another part of the gland there was a pinkish translucent fibroid nodule the size of a pea containing yellow foci, some gritty.

Iliac Glands on each side normal.

Lumbar Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

The Spleen.—Contained two tubercles, the size of a large shot, with yellow centre, and fibrous margins.

Liver.—On the anterior surface there was a flattened yellowish outgrowth, with a mulberry-like surface and slightly overhanging margins measuring 3 in. by 2 in. in superficial area and about $\frac{7}{20}$ in. in greatest thickness; it was composed of translucent fibroid tissue studded with yellowish foci; on the diaphragm in contact with this growth there was a similar flattened loosely attached growth, 1 in. by $\frac{3}{4}$ in.; on the anterior surface of the liver there were also two depressed scars (at these points the liver was adherent to the diaphragm); on section in the depth of the liver substance under each one of the scars two abscess cavities were seen, each about the size of a walnut; these had thick fibrous walls and purulent contents, resembling muco-pus; the rest of the liver substance was normal.

Portal Glands.—One large portal gland contained about 10 nodules, the largest the size of a pea; these had soft yellow centres and fibrous margins; in three other glands there were altogether six similar but smaller nodules.

In the fatty tissues just above the xiphisternum on the abdominal side of the diaphragm there was a soft yellow cyst, the size of a pigeon's egg; the cyst had fibrous walls of unequal thickness and thick creamy yellow purulent contents.

Kidneys.—On the surfaces of each a few pale depressed areas were seen; these on section were continued into the cortex in a wedge-shaped manner; the substance of the kidneys was tough, but no tubercles were seen.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Normal.

Parietal Pleura.—Normal.

Lungs.—Right cephalic lobe: On the dorsal surface there was a prominent nodule, the size of a wheat grain, with a yellow centre and reddish margins; near the tip of the ventral flap of this lobe was a large prominent growth measuring 4 by 3 by 0·7 cm.; this was dark red in colour, flattened on the surface, and had rounded, slightly overhanging margins; on section it was composed of fibroid translucent tissue studded with small yellow foci; in the fringes along the posterior border there was a red lenticular nodule 7 mm. in diameter, yellow and necrotic in the centre; in the substance of the lobe under the pleura there was a nodule the size of a large pea composed of firm reddish tissue, containing yellow foci.

The right middle lobe was normal.

In the left cephalic lobe under the pleura a few small grey tubercles, the size of mustard seeds, were seen.

Left caudal lobe: On the ventral surface there were two prominent nodules, one the size of a broad bean, the other that of a split pea; the latter was loosely pedunculated; on the mediastinal surface there was a large prominent growth similar in size and structure to that on the right cephalic lobe; in the lung tissue under this growth there was a nodule about 1 cm. in diameter composed of reddish tissue containing foci of gritty caseo-pus; under the pleura in various situations were seen irregular reddish areas affecting small lobules or parts of lobules; these on section showed soft yellow foci; deep in the substance of this lobe were two pea-sized nodules softened and yellow in the centre, greyish-red around the margins. In both caudal lobes under the pleura a few scattered grey tubercles were seen, the largest the size of a small shot.

Mediastinal Glands.—The long posterior gland contained about half a dozen tubercles, up to 2 mm. in diameter; these had yellow, slightly gritty centres and translucent margins.

The gland just above the bifurcation of the trachea contained three shot-sized tubercles, yellow in the centre.

The Right Bronchial Gland.—Contained one similar tubercle; the left contained two.

Infratracheal Glands.—Normal.

Alimentary Tract.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary, Parotid, Pharyngeal and Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—One towards the anterior extremity contained a firm nodule (2·5 mm.) with a yellow, slightly gritty centre; others were normal.

Gastric and Colic Glands.—Normal.

Various Lymphatic Glands.

Axillary, Lumbar, Iliac, Popliteal, Gluteal and Pudic Glands.—Normal.

Testicles.—Normal.

Microscopical Examination.

Second Local Tumour.—Numerous tubercle bacilli.

Liver Abscess.—No tubercle bacilli.

Abscess above Xiphisternum.—No tubercle bacilli.

A guinea-pig inoculated intraperitoneally with an emulsion from the second local tumour died in 43 days of general tuberculosis.

CALF 138.

Subcutaneous Inoculation of 10·8 cc. of an emulsion made from the prescapular gland of Calf 120.

Dose of Tubercle Bacilli—1,500,000.

Date—October 30th, 1903.

Age—15½ weeks.

Weight—1 cwt. 1 qr. 10 lbs.

Killed—May 19th, 1904. 202 days after inoculation.

Clinical History.

A fortnight after inoculation there was an elongated subcutaneous thickening, 3 in. by 1¼ in.; the prescapular gland was about twice the normal. The tumour and gland increased in size and attained their maximum about the middle of December, the former measuring 5 in. by 2½ in., the latter 4½ in. in long diameter. Both then remained stationary in size until the end of March, when they began to grow smaller.

On May 11th, 1904, the tumour was hard, moveable over the deep structures, and measured 3½ in. by 2 in. by a little over 1 in. thick; the prescapular gland measured 3½ in. in long diameter.

The temperature rose on the thirteenth day to 39·8° C., and remained slightly raised throughout the third week; subsequently it was normal except for an occasional slight rise.

The general condition of the animal was good during the whole of the experiment, and there was a steady increase in weight at the end of each week.

	cwts.	qr.	lbs.
Initial weight - - - - -	1	1	10
Final weight - - - - -	3	1	18
Gain in weight - - - -	2	0	8
Average weekly increase -			8·2

Tuberculin Tests.

April 7th, 1904. Positive. Rise of temperature, 2·2°C.

April 15th, 1904. Positive. Rise of temperature, 0·9° C.

April 18th, 1904. Negative. Rise of temperature, 0·3° C.

April 22nd, 1904. Negative. Rise of temperature, 0·3° C.

April 26th, 1904. Negative. No rise of temperature.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was an irregular hard tumour, 3 in. by 1¾ in. by 1 in., consisting of firm yellowish (fibroid) tissue beset with calcareo-caseous foci, and one or two small softened gritty caseous masses. The skin over the growth was greatly thickened and firmly adherent; the growth was also fixed to the underlying muscle, but neither the muscle substance nor the skin was infiltrated. At the inferior extremity of the tumour there were some small nodular masses of firm tissue showing calcareous deposit.

Left Prescapular Gland.—Measured 2¾ in. by 1⅔ in. by 1 in., and weighed a little less than 2 ozs.; on section it showed numerous more or less discrete calcareous tubercles and one or two small caseo-calcareous masses; the deposits occurred more in the central part of the gland, the cortex for a depth of an inch all round showed only scattered calcareous tubercles; the capsule of the gland was thickened, and there was a large excess of interstitial connective tissue.

Prepectoral Glands.—One left prepectoral gland was slightly enlarged, and contained a softened caseo-calcareous mass affecting about half the substance; two other glands in that region were normal.

Right Prescapular Gland.—Measured 3 in. by 1⅓ in. by ½ in. On section the tissue was œdematous and slightly congested; no sign of tubercle.

Right Prepectoral Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Spleen.—20 ozs. Normal on surface and on section.

Liver.—Normal.

One portal gland contained a tubercle the size of a shot, caseous in the centre; a second one showed in the cortex a calcareous particle.

Kidneys and Suprarenal Bodies.—Normal.

Small and Large Intestines. Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Thorax:

Heart and Pericardium.—Normal.

Lungs.—Right lung. The cephalic lobe contained a minute translucent tubercle; the middle and caudal lobes each showed beneath the pleura two nodules from 1·5 to 2·5 mm. in diameter; these had greyish margins and yellowish-white calcareous centres; on section one nodule was seen in the depth of the caudal lobe.

Left lung. The cephalic lobe contained four similar nodules, three on the surface and one in the depth—the rest of the lung was normal.

Thoracic Glands.—The caudal mediastinal gland showed in the cortex about half-a-dozen yellowish nodules 1·5 to 2 mm. diameter, containing in the centre calcareous grains; the nodules were not visibly caseous.

Two glands in front of this each contained a similar nodule.

A gland in the anterior part of the dorsal mediastinum showed a small yellow focus.

The left bronchial gland contained five, the right bronchial three, small nodules gritty in the centre.

The right peribronchial gland contained a small gritty tubercle.

Ventral mediastinal glands normal.

Pleura.—Normal.

The following lymphatic glands were normal:—

Submaxillary. Subparotid. Retropharyngeal-Cervical. Axillary. Lumbar. Coeliac. Iliac. Pre-crural. Popliteal. Gluteal. Ischiatic.

Tongue, Tonsils and Pharynx.—Normal.

Testicles and Pubic Glands.—Normal.

Microscopical Examination.

Smears from:—

The emulsion of Local Tumour and Prescapular Gland.—Numerous tubercle bacilli.

Left Prepectoral Gland.—Numerous tubercle bacilli.

Animals Inoculated.

An emulsion was made from the local tumour and the prescapular gland. The local tumour was used in addition to the prescapular gland because it was thought that an emulsion made from the gland alone would be too poor in bacilli; this expectation was not borne out by the count, which gave the big total of 12,027,333 tubercle bacilli per cc.

6·1 cc. of the emulsion were taken, and diluted to 50 cc.: 10 cc. of the dilution, containing approximately 14,670,000 tubercle bacilli were inoculated into each of two quarters of Cow 172: this cow, therefore, received the same dose as Cow 69. (*See* Table IIIa.)

One cubic centimetre of the undiluted emulsion, containing approximately 1,467,000 tubercle bacilli, was inoculated into each of the following animals:—

Guinea-pig 1011 (Subcut.).
Guinea-pig 1012 (Intrap.).
Guinea-pig 1013 (Intrap.).
Rabbit 50 (Subcut.).
Rabbit 57 (Subcut.).

Guinea-pigs 1011 and 1012 were killed after 27 days, and from their tuberculous organs an emulsion was prepared which was used to inoculate Cow 164 and Calf 184.

The other guinea-pig (1013) died of general tuberculosis in 47 days.

Two guinea-pigs inoculated with emulsions from the left bronchial gland and portal gland of Calf 138 respectively developed tuberculosis.

COW 172.

Intramammary—Inoculation of emulsion of the local tumour and prescapular gland of Calf 138.

Dose—1·22 cc., equal to 14,670,000 tubercle bacilli, into each of two quarters, left fore and right hind.

Date—May 20th, 1904.

Tuberculin Test—February 3rd, 1905. Positive 0·7° C. Good local reaction.

Killed—June 23rd, 1905. 392 days after inoculation.

Clinical History.

The cow was inoculated in the udder on May 20th, 1904, with an emulsion made from the local lesion and prescapular gland of Calf 138. The disease produced was of a very chronic type, and the animal was apparently in good health and condition when killed thirteen months after the commencement of the experiment.

A month after the intramammary injection all that could be detected in the udder was a nodular induration in the right hindquarter, the left forequarter had not undergone any appreciable change. Three months later the left forequarter was definitely indurated and nodular, especially in the anterior part. The right hindquarter was more diffusely indurated and still nodular. The general condition of the cow was good. In December, six months after the inoculation, the cow was in rather poor condition, and had become thinner. It improved, however, and in March its general condition was very good, and remained so till the end.

Ten months after the commencement of the experiment the left fore-quarter of the udder was slightly larger than the right fore, and was knotty and indurated. The right hind-quarter was also enlarged and hard, and both the supramammary glands were larger than normal. No further change was noted.

Weights.

	cwts.	qrs.	lbs.
May 24th, 1904. - - -	7	0	7
June 20th, 1905 - - -	7	3	22
Total gain in weight during experiment - - - -			99

Temperature.

The temperature rose slightly on the fourteenth day, remaining between 39 C. and 39·5° C. for four days. On the nineteenth day it again rose and remained above the normal for three days. With these exceptions there was no variation from the normal during the whole of the experiment.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Udder.—The udder, with the supramammary lymphatic glands and the skin, weighed 34 lbs.; alone it weighed 20 lbs. 4 ozs.

The inoculated quarters were perhaps slightly larger than the corresponding non-inoculated. The tissue of all the quarters was extremely tough, and was with difficulty cut; it showed a great increase in interstitial connective tissue, with fibrous trabeculæ ramifying in all directions. The milk sinuses and ducts were dilated; the walls were thickened, the internal surfaces being smooth and fibrous.

Right Fore Quarter.—The milk ducts appeared to be more thickened in this quarter than in the others, and stood up above the cut surface; the smaller ducts were filled with yellow purulent material.

Left Fore Quarter.—In the anterior part of the quarter, above the root of the teat, was a small group of nodules, the largest about 1 cm. in diameter. These had fibrous walls, and yellow cheesy gritty contents. In a corresponding position in the posterior part of the quarter there was a larger group of nodules; one of these was the size of an almond nut, and on removal of the caseous contents the cavity thus formed was seen to communicate with one of the milk ducts. In the rest of the quarter, chiefly in the inner wall and at the base, were scattered nodules, the largest the size of a barley grain; these had translucent fibrous walls and yellow gritty centres, which in the larger ones were softened.

Left Hind Quarter.—A few sparsely scattered tubercles, the size of millet seeds, with yellow centres and translucent fibrous walls, were seen; some of the smaller ducts near the base contained yellow purulent material, in which gritty particles could be felt.

Right Hind Quarter.—In the posterior part of the quarter above the root of the teat, was a small number of caseo-calcareous nodules with fibrous walls; in the anterior part there were several similar nodules. Lying within one of the larger milk ducts was an irregular dense yellow caseo-calcareous mass, which was almost completely extruded from its capsule. Several of the nodules, on evacuation of their contents, were found to be in communication with small ducts. In the rest of the quarter were scattered yellow tubercles, the size of millet seeds.

Supramammary Lymphatic Glands.—On the right side the posterior gland weighed 1 lb. 9 ozs., and measured about 6 in. by 4 in. by 3 in. On section the greater part of the gland was occupied by a large abscess cavity filled with thick viscid creamy yellow caseo-pus; the internal surface of the cyst was smooth, and showed thick raised trabeculæ of fibrous tissue, some of which passed across the cavity. The walls varied in thickness, and were composed of white fibrous tissue containing irregular yellow tubercles; in the anterior part of the cavity there was a mass, the size of a walnut, of firm yellow caseated tissue gritty from calcification. In the anterior part of the gland, and along the inner surface, was deeply congested œdematous glandular tissue, containing discrete irregular yellow tubercles, about the size of millet seeds.

In front of this gland was a smaller gland, measuring 2 in. by 1½ in. by nearly 1 in. On section this showed about a third of its substance occupied by a firm caseo-calcareous mass, with a scanty matrix of translucent fibroid tissue; the mass was surrounded by a capsule of white fibroid tissue.

The left supramammary lymphatic glands were much enlarged, weighing together 2½ lbs.; the capsule of the posterior gland was intimately adherent to the upper surface of the udder. On section the posterior part of the gland was converted into a thick fibrous walled cyst, filled with viscid caseo-pus containing calcareous particles. The anterior half was partly composed of irregular masses of firm caseo-calcareous tissue, and partly of viscid caseo-pus, the whole being surrounded by dense white fibrous tissue.

Anterior to the latter was a large gland, measuring 4½ in. by 3½ in. by 2¾ in. On section this was found to consist of two glands fused together, and surrounded by a thick dense layer of fibrous tissue. The posterior and larger gland showed cavities of various sizes, filled with caseo-pus and irregular caseo-calcareous masses. The anterior gland was soft, dark red in colour, and contained a number of yellow gritty nodules, ranging in size from a millet seed to a wheat grain or larger.

A small isolated gland, lying further forward on the udder, showed two pinhead-sized yellow foci.

Right Iliac Glands.—One, situated about the middle of the brim of the pelvis, showed on section a dark red medulla and minute yellow foci in the centre of some of the lymphoid nodules. A larger gland, lying nearer the sacrum, was dark red on section, but otherwise normal.

Left Iliac Glands.—On the left side there was one long flat gland, measuring four and a half inches in length; this showed a deeply congested medulla, against which the grey lymphoid nodules stood out in marked contrast; in the centres of most of the latter a small opaque yellow focus was seen.

Ilio-Sacral Glands.—Appeared normal.

Precrural Glands, Lumbar Glands.—Normal.

Omentum, Peritoneum.—Normal.

Spleen.—2 lbs. 2 ozs. Normal on section.

Liver.—Substance tough; showed under the capsule one or two irregular fatty areas; bile ducts thickened.

Portal Glands.—Normal.

Kidneys.—Each kidney showed in the cortex numerous small dark cysts and several pale wedge-shaped areas.

Suprarenals.—The left suprarenal body contained a fibrous nodule about 5 millimetres in diameter, opaque yellow, and gritty in the centre.

In the cortex of the right suprarenal there was a similar nodule about 3 millimetres in diameter.

Thorax:

Heart, Pleura.—Normal.

Lungs.—In the left cephalic lobe, under the pleura, was a pea-sized nodule, consisting of firm grey, somewhat translucent tissue, resembling gland tissue. With this exception the lungs were normal.

Bronchial Glands, Mediastinal Glands.—Normal.

Small Intestines.—Under the mucous membrane were a few irregular brownish calcareous nodules (? Parasitic).

Mesenteric Glands.—Contained numerous similar nodules.

Tongue, Pharynx, Larynx, Trachea, Submaxillary Glands, Parotid Glands, Pharyngeal Glands, All Peripheral Lymphatic Glands, Bladder, Uterus.—Normal.

Microscopical Examination.

Tubercle from Left Hind Quarter.—Moderate number of tubercle bacilli.

Right Suprarenal Body.—A few tubercle bacilli.

CALF 208.

This calf was born of Cow 172 on August 16th, 1904.

Cow 172 was an experimental animal, having received an intramammary inoculation 87 days before the birth of the calf.

The calf was brought up by hand on sterile milk, and was not allowed to suck its mother; it was not found possible to separate it entirely from her on account of no other stalls being vacant at the time, but it was securely tied up in a remote corner of the same stall.

It was tested with tuberculin on three separate occasions, 15, 71, and 122 days after birth respectively. On the first two occasions it failed to react; on the third the temperature rose 1·6° C., and there was a well-marked local reaction.

It was killed four weeks after the last test, when it was five and a half months old.

The post-mortem examination showed an ulcer in the small intestines; calcareo-caseous tubercle of one mesenteric gland and one coeliac gland; a pea-sized nodule in the spleen; a number of gritty tubercles in the caudal mediastinal gland, and two tubercles in the portal glands

There is no doubt that the calf became infected through the alimentary canal, probably by picking up litter on which its mother's tuberculous milk had been accidentally spilt.

It was unwise to have allowed it to remain so long in the same stall with its mother, but the case serves to illustrate one of the ways by which tuberculosis may spread from animal to animal.

The situation of the lesions and the fact that the calf failed to react when it was 71 days old prove the absence of congenital tuberculosis.

POST-MORTEM EXAMINATION.

Condition.—Good.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Subparotid Lymphatic Glands, Retropharyngeal Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Small Intestines.—At the anterior end of the long Peyer's patch there was an irregular ulcer, with raised margins and thickened caseous base; in the lymphoid tissue around the ulcer there were numerous yellow gritty tubercles, the size of a No. 4 shot; the serous surface was normal.

Large Intestine.—Normal.

Mesenteric Glands.—One of the terminal mesenteric glands was enlarged (to the size of a broad bean), and indurated. On section it was closely studded with yellow calcareous foci, and showed in the centre a small dense caseous mass; the other mesenteric glands were normal.

Ileo-Colic Glands, Colic Glands, Gastric Glands.—Normal.

Cœliac Glands.—One cœliac gland was greatly enlarged, and calcareo-caseous almost throughout (resembling the mesenteric gland).

Spleen.—Contained a pea-sized nodule, caseous and gritty in the centre, translucent around the margins.

Liver.—Normal.

Portal Glands.—Two affected, each containing a yellow gritty tubercle.

Kidneys, Suprarenal Bodies.—Normal.

Thorax:

Heart, Pericardium, Pleura, Lungs.—Normal.

Mediastinal Glands.—Caudal mediastinal gland, normal in size, contained at one extremity a series of discrete gritty yellow tubercles.

Other mediastinal and the bronchial glands were normal.

All peripheral lymphatic glands.—Normal.

GUINEA-PIGS INOCULATED WITH MILK OF COW 172.

Date of Inoculation.	No. of Guinea-pig	and Quarter.	Weight in Grammes.	Length of Life in days.			Killed or Died.	Result.
				Intrap.	Subcut.	Feeding.		
May 19, 1904. (This cow was inoculated on May 20, 1904).	1001	R.F.	260	—	57	—	K.	Healthy.
	1002		210	57	—	—	K.	Healthy.
	1003	L.H.	260	—	57	—	K.	Healthy.
	1004		240	57	—	—	K.	Healthy.
	1005	L.F.	210	—	57	—	K.	Healthy.
	1006		220	57	—	—	K.	Healthy.
	1007	R.H.	240	—	31	—	D.	No Tuberculosis.
	1008		240	57	—	—	K.	Healthy.
Feeding began May 31, Ended July 22 (52 days).	1021	L.F. and R.H.	490	—	—	52	K.	Slight Tuberculosis
	1022		520	—	—	79	K.	Tuberculosis, not severe.
	1023		580	—	—	12	D.	No Tuberculosis.
	1024		690	—	—	52	K.	Slight Tuberculosis
June 7, 1904. (Doses: Each pair of guinea-pigs was inoculated with the centrifugalised deposit from 30 cc. of milk).	1036	R.F.	330	—	83	—	K.	Healthy.
	1037		300	83	—	—	K.	Healthy.
	1038	L.H.	250	—	83	—	K.	Healthy.
	1039		220	83	—	—	K.	Healthy.
	1040	L.F.	310	—	61	—	D.	G.T.
	1041		270	57	—	—	D.	G.T.
	1042	R.H.	330	—	159	—	D.	G.T.
	1043		370	50	—	—	D.	G.T.
July 15, 1904. (Doses: As on June 7).	1113	R.F.	250	—	80	—	K.	Healthy.
	1114		250	80	—	—	K.	Healthy.
	1115	L.H.	230	—	80	—	K.	Healthy.
	1116		220	80	—	—	K.	Healthy.
	1117	L.F.	220	—	79	—	D.	G.T.
	1118		270	30	—	—	D.	G.T.
	1119	R.H.	270	—	51	—	D.	G.T.
	1120		220	54	—	—	D.	G.T.
Fed with milk from July 23 until August 23.	1133	L.F. and R.H.	680	—	—	42	K.	Healthy.
	1134		700	—	—	70	K.	G.T.
	1135		770	—	—	166	K.	No Tuberculosis.
	1136		620	—	—	146	D.	G.T.
	1137		820	—	—	42	K.	Healthy.
	1138		660	—	—	70	K.	G.T.
	1139		750	—	—	165	D.	G.T.
	1140		320		—	147	K.	G.T.

Guinea-pigs Inoculated with Milk of Cow 172—*continued.*

Date of Inoculation.	No. of Guinea-pig and Quarter.	Weight in Grammes.	Length of Life in days.			Killed or Died.	Result.
			In trap.	Subcut.	Feeding.		
August 24, 1904. (Doses : As on June 7)	1165 R.F.	240	—	141	—	K.	Healthy.
	1166	240	141	—	—	K.	Healthy.
	1167 L.H.	220	—	125	—	D.	G.T.
	1168	170	—	141	—	K.	Healthy.
	1169 L.F.	260	—	60	—	D.	G.T.
	1170	230	23	—	—	D.	G.T.
	1171 R.H.	200	—	63	—	D.	G.T.
	1172	160	29	—	—	D.	G.T.
September 27, 1904. Dose : 5·0 C. (not centrifugalised.)	1272 R.F.	210	—	—	—	D.	G.T.
	1273	260	109	—	—	D.	G.T.
	1274 L.H.	310	—	114	—	D.	G.T
	1275	250	79	—	—	D.	G.T
	1276 L.F.	300	—	51	—	D.	G.T.
	1277	290	16	—	—	D.	G.T.
	1278 R.H.	220	—	68	—	D.	G.T.
	1279	300	22	—	—	D.	G.T.
November 5, 1904. Dose : 5·0 CC. (not centrifugalised.)	1327 R.F.	220	—	102	—	D.	G.T.
	1328	450	129	—	—	D.	G.T.
	1329 L.H.	420	—	69	—	D.	G.T.
	1330	220	22	—	—	D.	G.T.
	1331 L.F.	220	—	45	—	D.	G.T.
	1332	510	23	—	—	D.	G.T.
	1333 R.H.	190	—	43	—	D.	G.T.
	1334	420	18	—	—	D.	G.T.
March 2, 1904. Dose : 5·0 CC. (not centrifugalised.)	1445 R.F.	450	—	33	—	D.	G.T.
	1446	500	23	—	—	D.	G.T.
	1447 L.H.	490	—	39	—	D.	G.T.
	1448	500	21	—	—	D.	G.T.
	1449 L.F.	410	—	48	—	D.	G.T.
	1450	540	21	—	—	D.	G.T.
	1451 R.H.	440	—	47	—	D.	G T.
	1452	440	18	—	—	D.	G.T.

COW 164.

Intramammary—Inoculation of emulsion of tuberculous organs of Guinea-pigs 1011, and 1012.

Dose—16·3 cc., equal to about 14,670,000 tubercle bacilli, into each of two quarters (L.F. and R.H.).

Date—June 16th, 1904.

Killed—When dying, August 2nd, 1904. 47 days after inoculation.

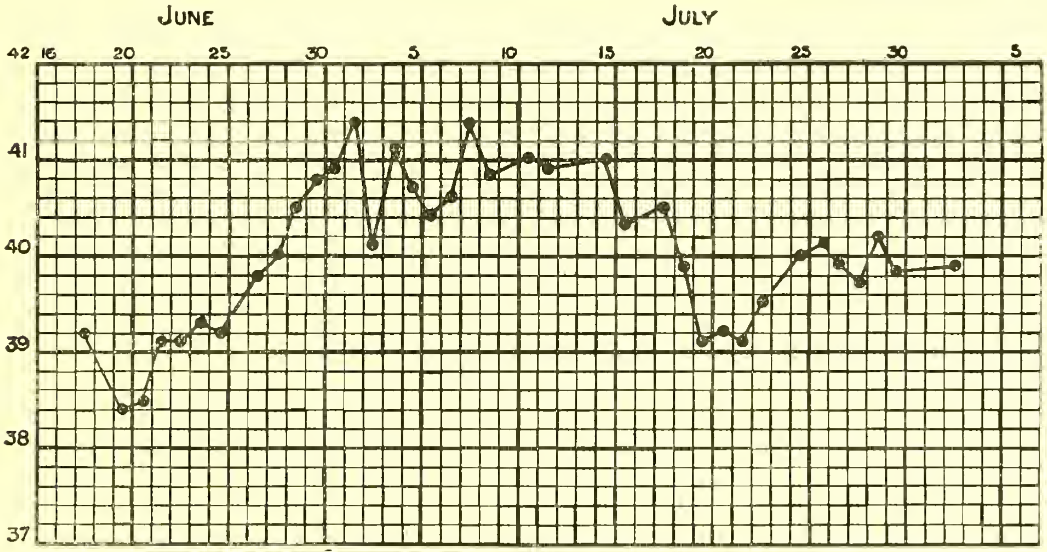
Clinical History.

The cow was inoculated in the udder on June 16th, 1904, for the special purpose of producing a supply of tuberculous milk to be used for feeding a series of animals. The emulsion used for the inoculation was made from the organs of two guinea-pigs that had been inoculated from the local tumour and prescapular gland of Calf 138.

Six days after inoculation the left fore-quarter was felt to be knotty and indurated just above the nipple, and a few days later similar changes were observed in the other inoculated quarter. Five weeks after the commencement of the experiment both the infected quarters were greatly enlarged and uniformly indurated, the knotty feeling having disappeared. The left precrural gland was enlarged and hard, and the animal had become much emaciated.

On July 20th (34 days after the commencement of the experiment, the cow gave birth prematurely to a calf, which died shortly afterwards. The placenta was retained and was not expelled till eight days afterwards. It was then much decomposed and foul-smelling. On August 2nd the cow was in a moribund condition, and was killed (47 days after inoculation). The cow was ill throughout the greater part of the experiment, and lost weight, but it should be pointed out that the septic condition of the uterus probably had some influence in shortening the duration of life.

Temperature.



POST-MORTEM EXAMINATION.

General Condition.—Very thin.

Udder.—There was considerable œdema about the udder, which was very greatly enlarged, the enlargement affecting the left fore and right hind quarters only. The udder weighed 26 lbs.

The non-inoculated quarters were yellowish in colour, fairly soft, and presented little or no sign of tubercle, except at the anterior inferior corner of the left hind quarter, where there was some considerable induration.

The inoculated quarters were very dense and firm, and were composed principally of yellow tubercles and caseating islands, thickly studding a more translucent fibrous tissue, which was darkly congested in parts. The more superficial portions of the gland were as usual the most affected, and here the caseous nodules had run together, forming large irregular yellow patches. In these minute yellow points, more opaque, and of a lighter colour, could be seen. They seemed to be points of more advanced caseation, and showed no trace of calcification. In the less affected parts, where the grey translucent tissue was most abundant, this was seen to be peppered with very minute yellow points.

The sinuses of the non-inoculated quarters contained small quantities of thick milk, while those of the inoculated quarters contained an opalescent straw-coloured fluid with flakes and traces of blood. The walls of these latter sinuses were studded with small prominent tubercles.

Supramammary Lymphatic Gland.—Was saddle-shaped, the two halves being united above, in the middle line. It was much enlarged, and weighed 2 lbs 4 ozs. The two halves measured, the left 5 in. by 4 in. by 2½ in., and the right 6 in. by 4 in. by 2½ in., the right side being a little larger than the left.

On section it was very firm, and was composed of the usual tuberculous tissue in an early stage of caseation, salmon pink in parts, and in other parts greyish white and mottled with hæmorrhages.

Precrural Glands:

Left.—Measured 3½ in. by 2 in. by 1 in. On section the greater part of its cortex was in a state of early caseation.

Right.—Slightly enlarged. Was soft and contained numerous minute specks (tubercles ?) in its cortex.

Iliac Glands.—Were much enlarged.

Right.—Weighed 10½ ozs.

Left.—Weighed 8 ozs.

They were soft, and on section showed numerous small tubercles in the cortex, so closely packed as to be almost continuous.

Between these were several other large glands, the largest almost as big as a hen's egg, and these on section were seen to be similarly affected, but not in quite so far advanced a condition.

The neighbouring hæmo-lymph glands, of which there were many, appeared to be normal.

Thorax:

Lungs.—In both lungs there was a considerable amount of interstitial emphysema. Close inspection showed numerous minute tubercles, grey and translucent, with yellowish centres, scattered throughout. These could be seen and felt, both on the surface and in the substance of the organ.

Thoracic Lymphatic Glands.—The right and left bronchial glands contained several tubercles.

The other thoracic glands appeared to be normal.

None of those glands were enlarged, and even the bronchial glands were very much less affected than the lungs.

Heart, Pericardium, Pleura.—Normal.

Abdomen.

There was a small collection of thick pus between the posterior surface of the liver and the rumen, not contained in a definite sac, but limited only by loose adhesions. No tubercle bacilli were found in the pus.

Omentum, Peritoneum.—Normal.

Liver.—A small number of minute yellowish tubercles were seen in the liver.

Hepatic Lymphatic Glands.—Normal.

Spleen.—On close examination two minute suspicious yellowish foci were found, in one of these tubercle bacilli were numerous.

Kidneys.—In the right were three or four very minute tubercles, just under the capsule; several were seen in the left also.

Suprarenals.—Normal.

Tongue, Pharynx, Palate, Tonsils, Pharyngeal Lymphatic Glands, Submaxillary Lymphatic Glands, Hyoid Lymphatic Glands, Parotideal Lymphatic Glands, Intestines, Mesenteric Glands,—Normal.

Uterus.—A purulent discharge was noticed from the vagina, and this was found to arise from the interior of the uterus, which on being opened was seen to be everywhere full of pus, but not distended. The mucous membrane was congested, and spotted with flakes of lymph. There was no appearance of tubercle.

Various Lymphatic Glands :

Right and Left Axillary, Right and left Pectoral Right Prescapular.—Normal.

Left Prescapular.—Normal. In its neighbourhood the hæmo-lymph glands were very well-developed and contained several minute tubercles (?). Another in the right axilla contained a similar focus.

Right and Left Popliteal, Right and Left Gluteal Right and Left Ischiatic, Cœliac.—Normal.

Microscopical Examination.

Pus from Uterus.—No tubercle bacilli. *Pus from PeritonealCavity*(abscess near the liver).—No tubercle bacilli.

Tubercle from Liver.—Tubercle bacilli. Three seen.

Tubercle from Kidney. Tubercle bacilli. Ten seen.

Right Precrural Gland - }
Tubercle from Spleen - } Tubercle bacilli numerous.

Right Bronchial Gland.—Tubercle bacilli scanty.

Left Bronchial Gland - }
Milk - - - - } Tubercle bacilli numerous.

Guinea-pigs Inoculated.

Two guinea-pigs inoculated from the spleen died of general tuberculosis.

THE CALF OF COW 164.

Cow 164 gave birth prematurely to a calf on July 20. The calf was apparently at about the seventh month of fœtal life, and died a few minutes after birth.

It showed no naked-eye evidence of tuberculosis on post-mortem examination. The right third of the liver was pale yellow in colour, and sharply demarcated from the rest of the organ, which was of normal appearance, except for a few yellowish patches. The surface of the light coloured portion of the liver was distinctly granular and on section numerous little white points were seen in the substance. Similar points were seen in the other part of the liver, but much more sparsely distributed. These little whitish points were strongly suggestive of early tuberculosis, but guinea-pigs inoculated with an emulsion made from them remained healthy.

The portal glands were healthy, and all the other organs in the calf were normal.

GUINEA-PIGS INOCULATED AND FED WITH MILK OF COW 164.

Date.	No. of Guinea-pig and Quarter of Udder.	Weight in Grammes.	Length of Life in days.			Killed or Died.	Result.
			Intrap.	Subcut.	Feeding.		
June 17, 1904.	1,061 R.F.	170	67	—	—	K.	Healthy.
	1,062 L.H.	110	—	67	—	K.	Healthy.
	1,063 L.F.	110	67	—	—	K.	No Tuberculosis.
	1,064 R.H.	110	—	67	—	K.	Healthy.
July 1, 1904. (Doses: Each pair of guinea-pigs was inoculated with the centrifugalised deposit of 30 cc. of milk.)	1,078 R.F.	190	—	88	—	K.	Healthy.
	1,079	200	88	—	—	K.	Healthy.
	1,080 L.H.	230	—	88	—	K.	Healthy.
	1,081	200	88	—	—	K.	Healthy.
	1,082 L.F.	200	—	24	—	D.	G.T.
	1,083	210	30	—	—	D.	G.T.
	1,084 R.H.	200	—	96	—	D.	G.T.
	1,085	200	33	—	—	D.	G.T.
Fed once, July 14, 1904.	1,102 L.F. and R.H.	1,100	—	—	41	K.	No Tuberculosis.
	1,103	240	—	—	41	K.	Healthy.
	1,104	730	—	—	93	D.	No Tuberculosis.
	1,105	180	—	—	96	K.	Healthy.
	1,108	1,050	—	—	9	D.	No Tuberculosis.
July 16.	1,121	870	—	—	42	K.	
July 14. Dose: 50,000 T.B.	1,106 L.F. and R.H.	220	—	31	—	D.	G.T.
	1,107	200	31	—	—	D.	G.T.
July 15. Dose: 5 c.c. not centrifulised.	1,109 R.F.	270	—	130	—	D.	G.T.
	1,110	230	54	—	—	D.	G.T.
	1,111 L.H.	240	—	131	—	D.	G.T.
	1,112	280	81	—	—	D.	G.T.
July 26, 1904. Dose: 50,000 T.B. each.	1,148 L.F. and R.H.	250	—	28	—	K.	G.T.
	1,149	260	—	67	—	D.	G.T.
	1,150	240	26	—	—	D.	G.T.
	1,151	360	18	—	—	D.	G.T.
Fed once. July 27, 1904.	1,152 L.F. and R.H.	160	—	—	41	D.	No Tuberculosis.
	1,153	950	—	—	42	K.	
	1,154	160	—	—	55	D.	G.T.
	1,155	790	—	—	55	K.	No Tuberculosis.
Fed from July 27 to August 2.	1,156 L.F. and R.H.	350	—	—	102	D.	G.T.
	1,157	260	—	—	70	K.	G.T.
	1,158	220	—	—	84	D.	G.T.

CALF 184.

Subcutaneous Inoculation of 1·65 cc. (diluted to 10 cc.) of an emulsion made from the tuberculous organs of Guinea-pigs 1011 and 1012; the latter animals were inoculated with an emulsion from the local tumour and prescapular gland of Calf 138.

Dose—1,500,000 tubercle bacilli.

Date—June 16th, 1904.

Weight—June 21st, 1904. 1 cwt. 3 qrs. 17 lbs.

Killed—January 26th, 1905. 225 days after inoculation.

Clinical History.

A week after inoculation there was a nodule, the size of a broad bean. At the end of six weeks a tumour had developed, which was flat, nodular, and roughly triangular in outline, measuring 2½ in. in length by 2 in. in breadth. It then began to soften, and became larger and more prominent. In November it measured 4 in. by 2½ in., and was very prominent, soft, and fluctuant.

The prescapular gland slowly enlarged, and on September 1st measured 4 in. in length; subsequently it diminished slightly in size.

The general condition of the animal was good throughout the whole of the experiment.

Tuberculin Tests.

October 4th, 1904. Doubtful. Rise of temperature, 0·5° C.

October 7th, 1904. Positive. Rise of temperature, 1·2° C.

October 20th, 1904. Negative. Rise of temperature, 0·3° C.

October 26th, 1904. Negative. Rise of temperature, 0·3° C.

November 1st, 1904. Negative. Rise of temperature, 0·4° C.

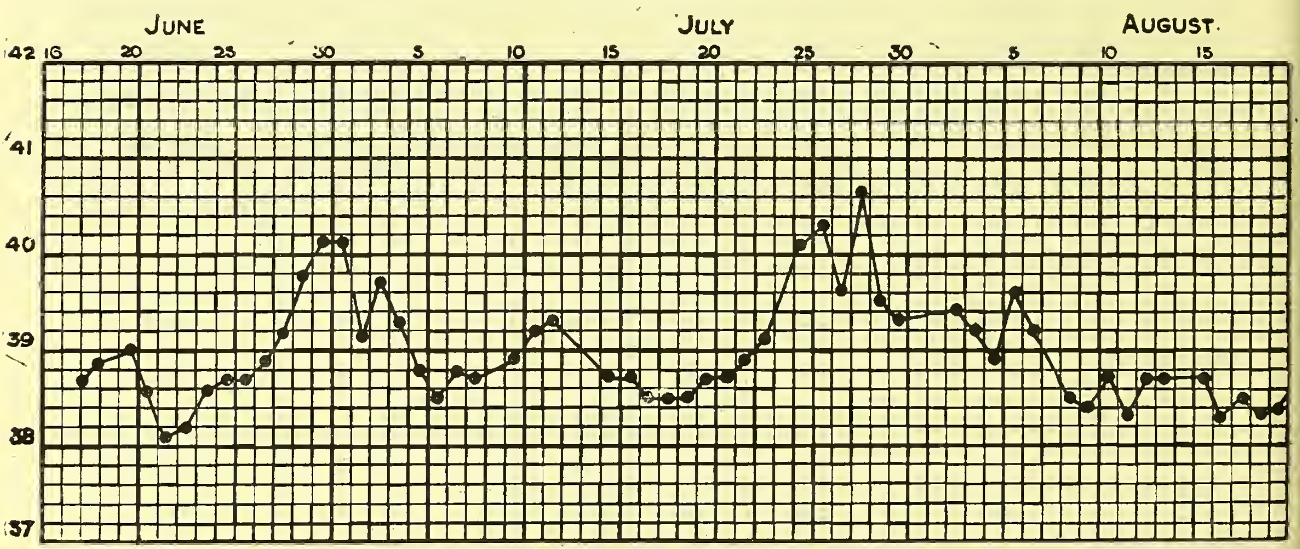
November 15th, 1904. Negative. No rise of temperature.

Weights.

	cwts.	qrs.	lbs.
June 21st, 1904 - - -	1	3	17
January 26th, 1905 - -	3	3	22
Gain in weight - -	2	0	5
Average weekly increase -	0	0	7·4

The animal was weighed every week and practically on every occasion an increase in weight was recorded.

Temperature.



The temperature from August 8th to the end of the experiment was normal, except for a slight rise to 39·7 on August 31st, and a sharp rise to 40·5° on September 16th.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Seat of Inoculation.—In the subcutaneous tissues on the right side of the neck there was an abscess, measuring 3 in. by 2 in. by about 1½ in., with thin fibrous walls and brownish yellow caseo-purulent contents, in which were several partially softened gritty caseous masses. The internal wall was lined by a thin layer of pinkish granulation tissue. On the external wall there were scattered some discrete caseous gritty tubercles, the size of a No. 4 shot.

Right Prescapular Gland.—Weighed 3 ozs., and measured 3 in. by 2½ in. by 1⅓ in. On section the greater part of the gland substance (two thirds) was replaced by softened caseous material resembling that in the local tumour, but containing larger and more calcareous caseous masses; the rest of the gland showed a number of softened caseous nodules, the largest about 1 centimetre in diameter; each nodule was surrounded by a thin capsule of fibrous tissue, and was infiltrated with calcareous particles.

Left Prescapular Gland.—Normal.

Right Prepectoral Glands.—Two superficial glands were normal; a deep gland showed two gritty caseous nodules with fibrous capsules, 3 and 8 millimetres in diameter respectively.

Left Prepectoral Glands.—Normal.

Cervical Glands.—A gland in the middle of the neck, on the right side, the size of a broad bean, was caseous and softened practically throughout, and appreciably gritty from calcification.

All other cervical glands were normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Normal on the surface. Showed in the pulp three caseous gritty nodules, the largest the size of a pea.

Liver.—Embedded in the substance, just under the capsule on the anterior surface, were two nodules, 5 millimetres in diameter, with thick fibrous walls and gritty caseous centres. In the depth of the liver eight similar nodules were seen ; these ranged from 5 to 10 millimetres in diameter.

Gall Bladder.—Normal.

Portal Glands.—Three of the portal glands were beset with yellow gritty caseous nodules, the largest the size of a pea ; a fourth gland was normal.

Kidneys.—Each kidney showed on the surface numerous pale areas, which on section were found to extend in a wedge-shaped manner into the cortex. No tubercles seen.

Suprarenal Bodies. —Normal.

Thorax :

Heart, Pericardium, Parietal Pleura.—Normal.

Lungs.—The left cephalic lobe contained two, the left caudal lobe four, pea-sized gritty caseous nodules, each surrounded by a thin fibrous capsule.

In the right cephalic lobe there were three similar nodules ; the right caudal lobe showed six nodules, the largest the size of a haricot bean.

The nodules in the right lobes were more softened than those in the left.

The fringes around the margin of the right caudal lobe were hypertrophied, but did not show tubercles.

Mediastinal Glands.—The long caudal gland measured 3 in. by 1 in. by $\frac{3}{8}$ in., and showed in the cortex about twenty hard gritty caseous nodules ranging in size from a No. 4 shot to a large pea. Other glands in the dorsal mediastinum were similarly affected, but contained fewer nodules. Each nodule was surrounded by a delicate fibrous capsule.

Bronchial Glands.—Left bronchial gland resembled the caudal gland.

Right bronchial contained one fibrous nodule, with yellow gritty foci in the centre.

The infratracheal gland showed four pea-sized gritty caseous nodules.

Ventral mediastinal glands normal.

Tonsils, Tongue, Pharynx, Larynx, Trachea, Large Intestines, Small Intestines, Pharyngeal Glands, Submaxillary Glands, Parotid Glands, Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Cœliac Glands.—One cœliac gland was slightly enlarged, and contained a number of gritty caseous nodules, ranging in size from a pin's head to that of a pea ; another cœliac gland showed one pea-sized nodule.

Left Lumbar Gland.—Contained half a dozen gritty caseous nodules with fibrous capsules, the largest 4 mm. in diameter.

Right Lumbar Gland, Sacro-Iliac Glands, Iliac Glands, Precrural Glands, Popliteal Glands, Gluteal Glands, Axillary Glands, Left Prescapular Gland, Left Prepectoral Gland, Testicles.—Normal.

Microscopical Examination.

Lung.—No tubercle bacilli.

Deep Prepectoral Gland.—Two tubercle bacilli.

Spleen.—Two tubercle bacilli.

Mediastinal Gland.—No tubercle bacilli.

CALF 142.

Subcutaneous Inoculation of culture from the original material.

The Culture was the sixth generation, 42 days old; the total age of the culture was 292 days.

Dose—12·5 milligrammes.

Date—April 7th, 1904.

Killed—When dying, June 6th, 1904. 60 days after inoculation.

Clinical History.

Six days after inoculation there was a subcutaneous swelling 3½ in. by 2½ in. by about ½ in. thick. At the end of a fortnight there was an elongated firm raised tumour 6 in. in length by 3¼ in. in breadth; the tumour covered and was moulded to the enlarged prescapular gland, which, however, was freely moveable. About 30 days after inoculation the tumour attained its maximum 7¼ in. by 3½ in.; the gland at this time measured nearly 6 in. in length; both diminished slightly in size before the end of the experiment.

The animal was first noticed to be ill a month after inoculation; the coat was rough and there was some loss of appetite. The respirations then became increased in frequency and finally laboured. The appetite further diminished and there was marked loss in flesh, emaciation in the end being extreme.

She was killed in a dying condition.

Tuberculin Tests.

April 15th, 1904 (8 days after inoculation of culture). Positive. Rise of temperature 1·1° C.

April 18th, 1904 (11 days after inoculation). Positive. Rise of temperature 1·5° C.

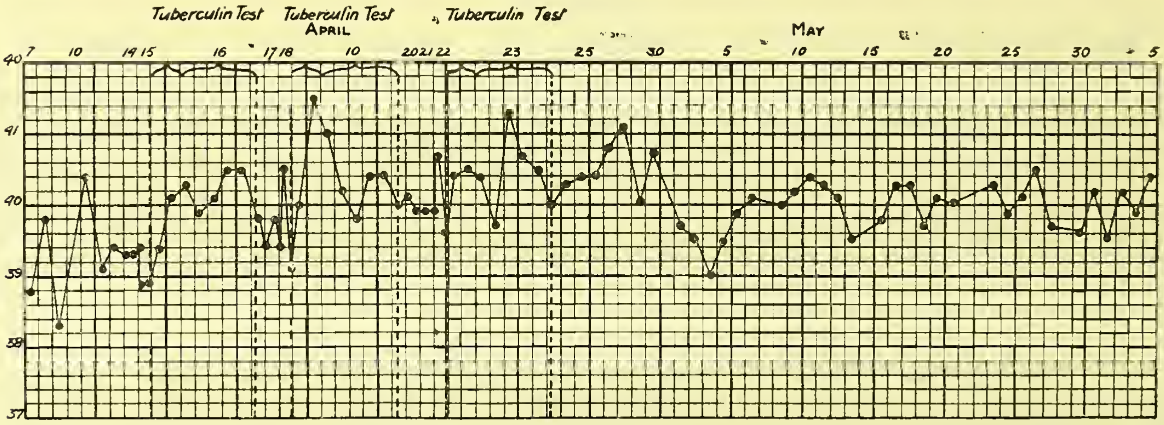
In both cases there was a slight local reaction.

Weights.

	cwts.	qrs.	lbs.
April 12th 1904 - - - -	2	1	19
April 26th, 1904 - - - -	2	2	0
June 7th, 1904 - - - -	1	3	13
Loss in weight in 9 weeks -	0	2	6
Average loss per week - -	0	0	6·9
Average loss during last 6 weeks - - - -	0	0	12

During the first fortnight there was a gain in weight of 9 lbs.; then during the remainder of the experiment there was a progressive decline in weight, the amount lost in this latter period being 71 lbs.

Temperature.



POST-MORTEM EXAMINATIONS.

Carcass.—Extremely emaciated.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a flat tumour 6½ in. by 3½ in. by 1½ in. On section it was composed of firm yellow caseo-necrotic tissue showing numerous small areas of softening; the tissue was perceptibly gritty, especially around the periphery. The tumour was thoroughly adherent to the skin and the underlying muscle, both of which it infiltrated to a slight extent.

In the tissues around the tumour and the prescapular gland there was a small amount of œdema fluid.

Left Prescapular Gland.—Weighed 5½ ozs., and measured 3½ in. by 2¼ in. by 1¾ in.; on section it consisted throughout of dense greyish yellow caseated tissue, which was just perceptibly gritty; at the lower part of the gland this tissue was not so uniform as in the upper, and could be seen to be made up of closely packed yellow tubercles; the capsule of the gland was very thickened.

The three prepectoral, the axillary, and the lower, mid and upper cervical glands on the left side were all enlarged and œdematous; each showed one or two minute caseous foci in the cortex.

Abdomen:

The omentum was almost completely devoid of fat; it showed on the inferior surface one small congested tubercle, the size of a pin's head.

The mesentery and serous surfaces of the intestines were very congested.

Spleen.—Weighed 12 ozs. The capsule was congested, but showed no tubercles; the substance was crowded with little tubercles, from 1 to 2 mm. in diameter, which appeared to have arisen in the Malpighian bodies. The tubercles were yellow and caseous in the centre, translucent at the periphery.

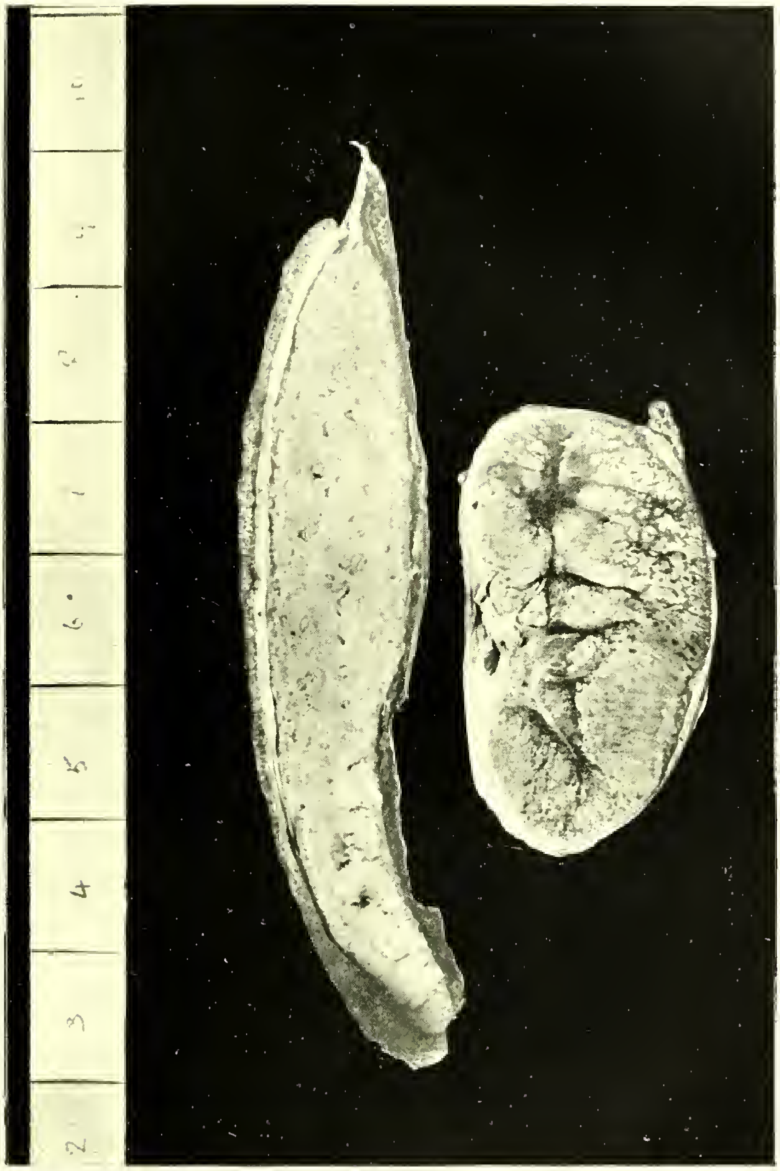
Liver.—Was normal on the surface; beneath the capsule there were several small collections of yellow points, extending some distance into the substance (possibly fatty; areas similar to these have been seen in the livers of other bovines, and in one or two instances have been inoculated into guinea-pigs, but without producing tuberculosis). Evenly distributed throughout the substance there were moderately numerous minute yellow tubercles, just visible to the naked eye.

Portal Glands.—Four in number, were greatly enlarged, and beset with small coalescing caseating tubercles.

Kidneys.—Both kidneys appeared to be enlarged, but were normal in colour; they showed in the cortex, immediately beneath the capsule, sparsely scattered translucent tubercles, about the size of pin's heads, with slightly opaque centres.

Suprarenal Bodies.—Were normal.

Four Cœliac Glands, ranging in size from a small bean to a large filbert, were closely beset with small caseating tubercles, which in the large gland had in many places become confluent.



CALF 142. Subcutaneous. Virus B. IV.
Local lesion and prescapular gland, cut longitudinally.

Small Intestine.—The great majority of the Peyer's patches showed caseating nodules from 2 to 3 up to 5 mm. in diameter. In the long Peyer's patch in the ileum they were very numerous, and occurred at short intervals; in the ileum there were also several small nodules in the mucous membrane; most of the nodules showed little central ulcerations.

Large Intestine.—Practically all the lymphoid follicles in the large intestine were enlarged, congested, and ulcerated; when cut into they showed yellow foci which could be seen through the serous coat. All the glands on the surface of the stomach were enlarged and firm, and showed early caseation.

Mesenteric Glands.—All the mesenteric glands, without exception, were enlarged, and showed varying amounts of firm greyish or pinkish grey translucent tissue, beset with yellow caseous foci; three large glands at the anterior end of the mesentery and two at the posterior were greatly enlarged, and practically tuberculous throughout.

All the meso-colic glands were enlarged to the size of kidney beans, and showed on section firm translucent tissue beset with caseous foci.

Thorax:

Lungs.—Were heavy, of a firm consistence, and when squeezed between the fingers and thumb felt shotty; the surfaces had a mottled appearance, and showed beneath the pleura numerous small grey translucent tubercles closely crowded together, especially in the cephalic lobes; the tubercles had opaque caseous centres. On section similar tubercles permeated the substance of the lung; in many places the tubercles had coalesced to form masses, irregular in outline, which in the cephalic lobes (where the tubercles were most numerous) almost completely filled up the lobules; the lung tissue between the tubercles was congested and œdematous.

The fringes around the margins of the lungs and on the surface were congested, but were not hypertrophied, and did not contain tubercles.

Thoracic Glands.—The mediastinal and bronchial glands were greatly enlarged, and together weighed about 12 ozs.

The caudal mediastinal gland measured 8 in. by 2 in. by ¾ in., and weighed 6 ozs.; on section the gland substance was seen to be extensively replaced by firm greyish, somewhat translucent tissue, in which were embedded small caseous masses and foci; in the cortex the caseous foci formed a narrow almost continuous line; the gland tissue not affected by tubercle was congested and œdematous. The caseous areas were appreciably calcareous.

The gland anterior to this was similarly, but not so extensively affected.

The left bronchial gland was greatly enlarged, and on section resembled the caudal gland.

The right bronchial glands, two in number, were œdematous, and beset with caseous, slightly gritty tubercles.

Two right, and one left, peribronchial glands were enlarged to the size of small walnuts, and beset with confluent caseating tubercles.

On the ventral surface of the trachea there were two large glands (infra-tracheal); one resembled the mediastinal; the other was œdematous and infiltrated with early tuberculous nodules, which had not begun to caseate.

Two ventral mediastinal glands (suprasternal) were enlarged, and showed small caseous foci.

Pleura.—The parietal pleura was normal.

Heart.—The pericardial surface was normal, except for numerous little petechial hæmorrhages in the fat along the coronary arteries. Muscle and valves were normal.

Tonsils.—The right tonsil showed in one of the crypts a little soft yellow secretion, which easily shelled out. (Numerous tubercle bacilli found in a smear.)

The left tonsil showed crypts filled with secretion, but this was not examined microscopically.

Various Lymphatic Glands.

The retropharyngeal, submaxillary, and subparotid glands were congested and œdematous, and showed in the cortices one or two congested caseous tubercles.

The right superior cervical (near the hyoid bone), the right axillary, the right prepectoral and the right prescapular glands also showed small caseous foci.

Scattered caseous foci were also seen in the left gluteal, both popliteal and supramammary, the left precrural, the right iliac, sacro-iliac and lumbar lymphatic glands.

A pigmented gland near the right suprarenal showed numerous small tubercles in the cortex.

The left iliac, the right precrural, the right gluteal and the ischiatic glands appeared normal.

Three hæmo-lymph glands near the local lesion, and several at the bifurcation of the abdominal aorta, showed translucent tubercles with opaque yellow central points.

Mammary Gland.—In the right hind part of the mammary gland there was a suspicious yellow point, which shelled out; no tubercle bacilli were found in a smear.

Fallopian Tubes.—Normal

Microscopical Examination.

Right Tonsil.—Numerous tubercle bacilli.

Left Prescapular Gland.—Numerous tubercle bacilli; many in clumps.

Left Axillary.—Numerous tubercle bacilli.

Large Intestine (*nodule*).—Numerous tubercle bacilli.

Small Intestine (*nodule*).—Very numerous tubercle bacilli.

Right Prepectoral Gland.—Very numerous tubercle bacilli.

Supramammary Lymphatic Gland.—Very numerous tubercle bacilli.

Hæmo-lymph Gland (near local lesion).—Very numerous tubercle bacilli. (Bacilli very short.)

CALF 218.

Subcutaneous Inoculation of culture derived from the original material of Virus B IV.

The culture was the 16th generation, 20 days old, and had been in cultivation a total period of 459 days.

Dose—46 milligrammes.

Date—October 31st, 1904.

Weight—November 1st, 1904. 1 cwt. 2 qrs. 10 lbs.

Age—4 months.

Killed—When very ill, December 2nd, 1904. 32 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 31st, 1904.

Eleven days after inoculation there was a pear-shaped tumour, measuring 4 in. by 3 in. by a little over 1 in.; the prescapular gland was 3 in. in long diameter and the spherical prepectoral gland could just be felt.

Three weeks after inoculation the local tumour and the prescapular gland attained their maximum size, the former measuring 5 in. by 3½ in. by 1½ in., the latter 4½ in. in length. Constitutional symptoms were first noticed towards the end of the third week; the respirations were increased, and there was occasional cough.

The calf rapidly became worse; the respirations gradually increased in frequency and were finally laboured and jerky.

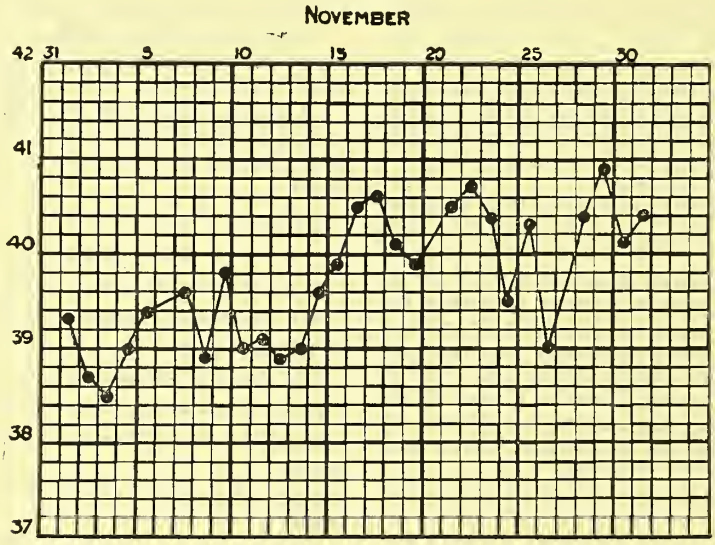
On December 2nd the calf was so very weak and emaciated and looked so very ill that it was decided to kill it.

Weights.

During the first week the calf gained 1 lb.; at the end of the second week there was a loss of 1 lb. on the original weight; in the third week the animal lost 11 lbs., and in the fourth 15 lbs.

	cwts.	qrs.	lbs.
November 1st, 1904 -	1	2	10
November 8th, 1904 -	1	2	11
November 15th, 1904 -	1	2	9
November 23rd, 1904 -	1	1	16
November 30th, 1904 -	1	1	1
Loss in weight from November 1st to November 30th, 1904-	–	1	9

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Greatly emaciated.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a firm tumour, measuring 5 in. by 3¼ in. by 1¼ in. and weighing, with the skin and thin layer of superficial muscle, to which it was adherent, 10 ozs.

On section it was composed of salmon-pinkish yellow necrotic tissue, firm and tough in the lower part, spongy and breaking down in the upper; the cut surface showed numerous petechial points of hæmorrhage. The growth was firmly adherent to the skin and superficial muscle, but infiltrated them only to a slight extent.

Left Prescapular Gland.—Weighed a little over 4 ozs., and measured 4¼ in. by 2½ in. by 1¼ in. On section the whole of the cortex was tuberculous, consisting partly of dense pinkish-yellow caseated tissue, and partly of firm translucent tissue, closely beset with opaque yellowish-white streaks and foci.

Right Prescapular Gland.—Was normal in size, and showed in the cortex a few small tubercles.

Left Prepectoral Glands.—One, the size of a marble, showed in one part of the cortex a small mass of firm translucent tissue, studded with caseous foci; two other prepectoral glands contained scattered caseous tubercles.

Cervical Glands.—On the left side, near the mastoid process, there were two glands; one, the size of a broad bean, showed the whole of the cortex tuberculous, and in a state of early caseation; the other, smaller in size, contained a small tuberculous mass. The corresponding glands on the opposite side contained a few small caseous tubercles. The mid cervical glands on both sides resembled the latter. The posterior cervical glands showed no foci.

Axillary Glands, Right Prepectoral Glands.—Showed a few caseous foci.

Abdomen :

Omentum.—Was almost completely devoid of fat, and showed on its inferior surface sparsely scattered translucent tubercles, mostly the size of pins' heads.

Spleen.—Weighed 11 ozs. The surface was normal. except for a number of delicate congested villous tufts; the pulp was crammed with spherical tubercles, varying from 1 to 1·5 mm. in diameter; the tubercles were grey, and showed minute opaque yellow central foci.

Liver.—Weighed 4 lbs. 4 ozs., and appeared slightly swollen; the parenchyma was yellowish-red, and closely beset with grey miliary tubercles, some of which were just beginning to caseate; many of the surface tubercles caused slight elevations under the capsule.

Gall Bladder.—The mucous membrane of the gall bladder showed several minute ulcers with yellow floors.

Portal Glands.—Were enlarged, and showed in the cortices confluent masses of grey translucent tissue, studded with caseous foci.

Kidneys.—Left kidney showed on the surface fairly numerous greyish-white miliary tubercles (twelve to twenty counted on the surface of each large lobule); similar tubercles were seen on section; the medullary zone was free.

Right kidney resembled the left.

Both kidneys showed numerous pale wedge-shaped areas.

Suprarenal Bodies.—In the cortex of the left there was a pinhead sized tubercle.

The right was normal.

Thorax :

Heart.—Pericardium and muscle substance normal; on the endocardium of the right ventricle there was a greyish white tubercle, the size of a pin's head; valves normal.

Pleura.—The fringes along the margins of the ribs were not hypertrophied, and did not contain tubercles.

Diaphragm.—The pleural surface of the tendon of the diaphragm presented some recent tuberculous granulations.

A small congested gland in the caval fold of the pleura contained a few early tubercles.

Lungs.—The ventral portions of the cephalic and caudal lobes on both sides were dark red in colour, firm, and quite airless. The dorsal portions, and the posterior parts of the caudal lobes, were more or less normal in colour and crepitant throughout, except for an occasional consolidated lobule (about half the cephalic lobes and a third of the caudal lobes were solid); in the caudal lobes there were several areas of interstitial emphysema.

The substance of the lungs was closely beset with grey miliary tubercles, slightly opaque in the centre. The tubercles were more numerous and appeared larger in the consolidated parts than in the crepitant; in the former they projected from the surface, but not in the latter.

The bronchi in the collapsed portions were plugged with yellow muco-pus.

The fringes around the margins of the lungs were not hypertrophied.

Mediastinal Glands.—Were moderately enlarged. The caudal mediastinal gland weighed 2½ ozs

On section the cortex was composed of firm grey translucent tissue, studded in some parts with opaque yellowish white foci, and in others penetrated with a fine yellow network.

The glands anterior to this in the dorsal mediastinum were similarly affected; they weighed, together with the caudal gland, 5 ozs.

Bronchial Glands.—Were enlarged to four or five times the normal; on section they resembled the mediastinal glands.

The medullary parts of the above glands were congested and œdematous.

Two enlarged glands below the trachea were similarly, but not so extensively, affected.

The ventral mediastinal glands contained a few minute caseous foci.

Alimentary Tract :

Tonsils.—Each tonsil showed on section a few very minute yellow points.

Tongue, Pharyngeal Mucous Membrane.—Normal.

Pharyngeal Glands.—Showed fairly numerous discrete tubercles.

Submaxillary Glands.—Contained similar tubercles; these were less numerous in the right than in the left.

Intestines.—The small intestine showed sparsely scattered caseous foci, some in Peyer's patches, others beneath the mucous membrane.

Large intestine normal.

Mesenteric Glands.—Almost all the mesenteric glands contained scattered miliary tubercles with caseous centres.

Gastric Glands, Pancreatic Glands.—Were similarly affected.

Various Lymphatic Glands :

Subparotid Glands, Precrural Glands, Pudic Glands, Popliteal Glands, Gluteal Glands, Iliac Glands, Vertebral Glands.—Contained a few small caseous tubercles.

Ischiatic Glands.—Appeared normal.

Coeliac Glands.—Enlarged and closely beset with miliary tubercles, which in the largest glands were confluent.

Renal Gland.—Enlarged, and beset with opaque miliary tubercles.

Lumbar Glands.—Enlarged and œdematous; showed in the cortices small translucent masses studded with opaque foci.

Most of the hæmo-lymph glands examined showed grey miliary tubercles.

Testicles.—Normal.

Microscopical Examination.

Left Tonsil.—Fairly numerous tubercle bacilli.

Intestine.—Numerous tubercle bacilli.

Mesenteric Gland.—Moderately numerous tubercle bacilli.

Gluteal Gland *Kidney* *Hæmo-Lymph Gland*	Numerous tubercle bacilli.

Pus from Bronchus.—One tubercle bacillus seen.

Left Suprarenal Body *Heart Tubercle*	No tubercle bacilli.

CALF 220.

Subcutaneous Inoculation of culture derived from the original material of Virus B. IV.

The culture was 20 days old, 16th generation, and had been in cultivation a total period of 459 days

Dose—50 milligrammes.

Date—October 31st, 1904.

Weight—November 1st, 1904. 1 cwt. 3 qrs. 13 lbs..

Age—4 months.

Died—December 6th, 1904. 36 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 31st, 1904.

Two days later a slight thickening was felt at the seat of inoculation. On November 11th, 11 days after inoculation, there was a prominent pear-shaped tumour measuring 5½ in. by 3½ in. by about 2 in. in thickness; the prescapular gland measured 4 in. in long diameter, and a prepectoral gland was about the size of a bagatelle ball.

On November 21st, three weeks after inoculation, the tumour had grown to a very large size and measured 8 in. in length by 3½ in. in breadth; it appeared to be undergoing softening in the centre. In front of the left shoulder there was a large adherent mass measuring 8 in. in length by 4 in. in breadth. This mass was apparently composed of the greatly enlarged prescapular gland and the thickened and infiltrated tissues surrounding it. The muscles between the local tumour and the prescapular gland were infiltrated and very hard, and there was well marked œdema of the dewlap. The respirations were increased in frequency and the animal was obviously losing flesh.

During the remainder of the experiment the local conditions were unaltered, with the exception that the infiltration around the prescapular gland became less extensive and the prescapular gland more moveable.

The constitutional symptoms increased in severity; the respirations became quicker and more laboured, and there was marked emaciation.

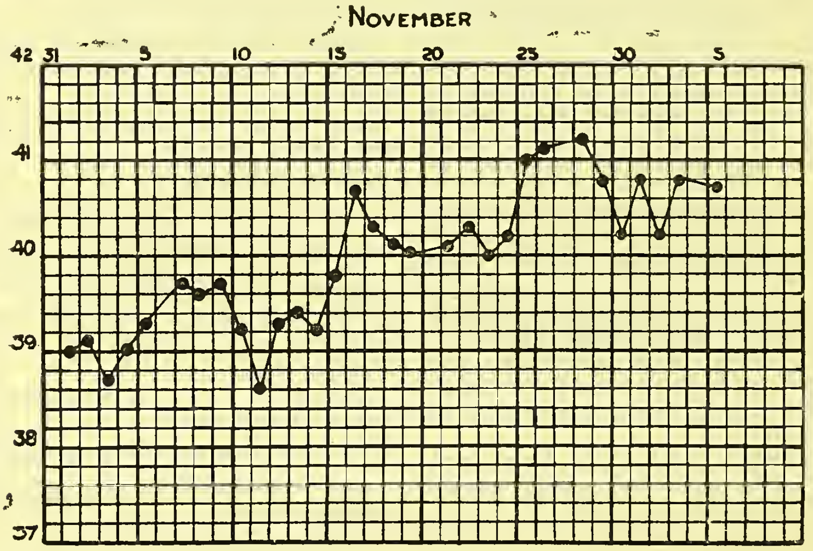
The calf died on December 6th, 1904, 36 days after inoculation.

Weights.

During the first fortnight there was a gain in weight of 1 lb.; then the animal steadily lost in weight.

	cwts.	qrs.	lbs.
November 1st, 1904 -	- 1	3	13
November 14th, 1904 -	- 1	3	14
November 23rd, 1904. -	- 1	2	24
November 30th, 1904 -	- 1	2	7
Loss in weight - -	-	1	6
Average daily loss during last 16 days - -	-	-	2·2

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Greatly emaciated.

Seat of Inoculation.—In the subcutaneous tissues on the left side of the neck there was an elongated tumour measuring 6½ in. vertically, 4 in. transversely, and 1½ in. in thickness, and weighing, with the skin to which it was attached 1 lb. 5 ozs.

On section it was composed of the usual dense pinkish yellow necrotic tissue, which in the upper part had broken down to form an irregular cavity 2½ in. by 2 in. by 1 in.; the cavity was filled with turbid brownish yellow fluid, containing shreds of necrosed tissue; the internal walls showed irregular partially detached yellow sloughs. The skin was intimately adherent, deeply congested, and opposite the cavity was infiltrated right up to the surface with numerous yellow tubercles. On the external surface the skin was covered with dried fissured secretion, which when removed exposed a red raw surface.

The muscle on which the tumour lay was intensely congested, and closely infiltrated for a depth of ½ in. with yellow caseous nodules and tubercles.

Extending between the local tumour and the inferior extremity of the prescapular gland (in the position of the sternomastoid) there was a firm band, 2 in. in breadth and 1 in. in thickness, consisting of pearly white fibrous tissue and fibroid muscular tissue studded with yellow caseous masses and tubercles.

A smaller band, continuous with the above, extended as far as the first prepectoral gland, to the capsule of which it adhered.

Left Prescapular Gland.—Triangular in transverse section; measured 2½ in. by 2 in., and weighed 9 ozs. The superficial muscles covering it were intimately adherent, and infiltrated with tubercles, which appeared to have grown through the capsule. On section the greater part of the gland was composed of dense pinkish yellow caseated tissue, sprinkled with opaque yellow foci, which were just perceptibly gritty; a small part of the cortex of the gland showed firm translucent pinkish grey tissue, studded with opaque caseous foci.

The tissues surrounding the local tumour and neighbouring glands were infiltrated with gelatinous œdema fluid.

Prepectoral Glands.—The rounded prepectoral gland was greatly enlarged, measuring 1½ in. in diameter; it was very hard and composed throughout of dense pinkish yellow caseated tissue; the capsule of the gland was thickened, and infiltrated with caseous tubercles.

A second prepectoral gland, the size of a large filbert, was intensely hæmorrhagic; half the gland felt harder than normal, and showed on section yellow points against a dark red background. (Tubercle bacilli very numerous.)

A third and deeper gland, the size of a marble, was indurated, and showed on section firm red tissue penetrated with a yellow network.

A gland situated near the posterior border of the first rib, the size of a filbert, was dark red, firm, and showed in the centre scattered yellow points.

Cervical Glands.—The left deep and mid-cervical glands resembled the latter. One upper cervical gland, the size of a large plum, showed at one extremity an indurated mass in a state of early caseation.

The glands on the right side were intensely congested, and showed discrete caseous tubercles in their cortices.

Abdomen:

Omentum.—The omentum showed numerous dark red tubercles, yellow in the centre, ranging in size from a mustard seed to a wheat grain.

The peritoneal sac contained about 30 cc. of blood-stained fluid.

On the surface of the rumen there was one congested tubercle.

Spleen.—Greatly swollen; weighed 1 lb. 9 ozs. On the surface there were three loosely attached dark tubercles, slightly opaque in the centre. On section the pulp was packed almost as closely as possible with spherical tubercles, necrotic in the centre, the largest the size of a No. 1 shot. The small amount of splenic tissue that remained was soft, dark red, and diffluent.

Liver.—Greatly enlarged; weight 8 lbs. 3 ozs. The surface was mottled with purplish and yellow patches; the substance was soft, yellowish, and very closely beset with grey miliary tubercles; under the capsule many of the tubercles had a flat lenticular shape, and measured about 2 millimetres across, but in the substance they were all spherical and about 1 millimetre in diameter.

Gall Bladder.—Mucous membrane normal.

Portal Glands.—Enlarged to three or four times the normal. Showed on section in the cortices irregular greyish, somewhat translucent masses, which were evidently caused by very early tuberculous infiltration.

Kidneys.—Were enlarged, pale and soft; they showed in the cortices, on the surfaces as well as on section, numerous grey miliary tubercles; the medullary zones were free from tubercles.

Suprarenal Bodies.—No tubercles seen.

Thorax:

Heart.—The pericardial sac contained several cubic centimetres of straw-coloured fluid and one or two flakes of yellow lymph.

The pericardial surface was injected, but was free from tubercles.

The heart muscle was soft and flabby.

The cavities of both ventricles and auricles were filled with dark red blood clots; the clots in the ventricles extended into the pulmonary artery and aorta. There was a minute grey tubercle on the endocardium of the right ventricle; with this exception the endocardium was normal.

There was an excess of fluid in the pleural cavities.

Pleura.—The fringes along the margins of the ribs were slightly hypertrophied and deeply congested; they showed here and there small flattened greyish white tubercles.

On the pleural surface of the pericardium there were some dark red villous vegetations, at the bases of which minute tubercles, resembling grains of sand, could be seen and felt; there were also a few tubercles similar to those on the parietal pleura.

On the pleural surface of the diaphragm there was a slight development of vegetations similar to those on the pleural surface of the pericardium; there were besides about half a dozen dark red loosely attached nodules, yellow in the centre, the size of barley grains.

Lungs.—Were very heavy, and weighed with the bronchial and mediastinal glands, 10 lbs.

The cephalic lobes and anterior and ventral portions of the caudal lobes were firm (carnified), dark red and completely consolidated; they showed on the surfaces very numerous slightly projecting grey tubercles, the size of mustard seeds (some of the tubercles on the dorsal surfaces were flattened out as in the liver); on section the tissue of the lobules was very firm, dark red, and closely beset with minute tubercles similar to those on the surface; a few of the tubercles appeared to have opaque centres; the bronchi in the solid parts were filled with yellow muco-pus.

The greater parts of the caudal lobes were air-containing, and were only slightly congested and œdematous. On section they were closely beset with tiny tubercles, similar to those in the consolidated lobes, which stood out from the cut surface.

Mediastinal Glands.—The caudal mediastinal gland measured 5 in. by 2¾ in. by 1 in., and weighed 3 ozs. On section the medulla was soft, red, and œdematous; the cortex was firmer than normal, pinkish-grey, and dotted here and there with yellow points.

All the glands in the dorsal mediastinum anterior to this were much enlarged, and resembled the caudal gland.

Bronchial Glands.—The left bronchial gland was enlarged to four or five times the normal. On section it resembled the mediastinal gland, with the exception that the yellow foci were more numerous; in places a fine yellow network was just visible.

The right bronchial gland was enlarged and intensely congested; it resembled the left bronchial.

Two enlarged glands below the trachea showed on section firm reddish-grey tissue studded with yellow foci.

The peribronchial glands were enlarged, œdematous but not congested; their cortices were evidently infiltrated with cells, but no yellow foci were seen.

The trachea and bronchi were filled with frothy mucus.

Tonsils.—Both tonsils were hæmorrhagic, and showed minute opaque foci.

Pharyngeal mucous membrane congested; otherwise normal.

Intestines.—The small intestines throughout their whole length showed scattered on the mucous surface soft greyish-white foci, which were readily scraped away with the end of a knife. (Numerous tubercle bacilli found.)

Large intestines normal.

Gastric Glands, Mesenteric Glands, Colic Glands.—Not enlarged. Contained in the cortices numerous discrete grey tubercles with opaque yellow centres.

Left Iliac Gland.—Closely beset with opaque tubercles varying from 1 to 2 mm. in diameter.

Right Iliac Gland.—Contained similar, but fewer tubercles.

Lumbar Glands, Cœlic Glands, Ilio-Sacral Glands, Renal Gland.—Resembled the left iliac.

The undermentioned glands were all intensely hæmorrhagic and showed discrete caseous tubercles in their cortices:—

Right and Left Pudic, Right and Left Gluteal, Right and Left Ischiatic. Precrural (left more than right), *Right and Left Popliteal, Right and Submaxillary. Right and Left Post-Pharyngeal, Parotid, Right Axillary, Right Prepectoral* (foci very small), *Inferior Mediastinal, and Vertebral.*

The left axillary gland showed no macroscopic tubercles.

Right Prescapular Gland.—Was slightly enlarged, and studded with discrete caseous tubercles.

All the hæmo-lymph glands examined showed small tubercles.

Mammary Gland, Uterus, Bladder, Eyes.—Normal.

Microscopical Examination (Smear Preparations).

Second Prepectoral Gland.—Very numerous tubercle bacilli.

Right Tonsil.
Left Upper Cervical Gland
A Hæmo-Lymph Gland
Left Iliac Gland
Spleen - - - -
Numerous tubercle bacilli.

Intestine.—Moderately numerous tubercle bacilli.

A Guinea-pig Inoculated intraperitoneally with an emulsion made from the spleen died in 14 days of acute tuberculosis.

CHIMPANZEE 4.

Subcutaneous Inoculation of culture derived from the original material of Virus P. IV.

Date of Inoculation—October 31st, 1904.

Dose—1·0 milligramme.

Died—December 26th, 1904; 55 days after inoculation.

Clinical History.

The chimpanzee was inoculated subcutaneously over the right scapula on October 31st, 1904. Two days later a slight thickening was felt at the seat of inoculation; this rapidly increased in size, and in eight days there was a prominent rounded fluctuant tumour two inches in diameter, standing about a quarter of an inch above the surface. The axillary glands on both sides were definitely enlarged and hardened, those on the right side being larger than those on the left (the glands were first felt to be enlarged on the sixth day).

On November 11th, eleven days after the inoculation, the swelling was three inches in diameter, and was very soft and fluctuant; the skin over the central part was inflamed and thinned, and tender to the touch. The axillary glands on the right side were very large, those on the left side being about half the size.

On November 14th, disturbance of the general health was first noted (rough coat, anxious expression, etc.); the skin over the abscess broke down during the night, a minute aperture forming near one margin; the tumour was smaller and did not project so much above the surface; pressure on the tumour caused glairy ill-formed pus to exude through the puncture. Microscopical examination of the pus showed broken down pus cells and numerous tubercle bacilli, many of which were long and beaded.

The chimpanzee up to this time had lived with three other chimpanzees; as soon as it was found that the abscess had broken down she was promptly removed to a separate cage, and the skin around the ulcer treated night and morning with an antiseptic lotion.

November 21st. There has been a constant discharge from the skin opening, which is a little larger; the local lesion is now represented by a shallow depression in the skin with slightly raised thickened margins; an enlarged gland was felt a few inches below the occiput, a little to the right of the mid line; the large axillary gland on the right side feels a little smaller. The animal is obviously ill; her coat is staring; she is much thinner, and her appetite is very capricious.

December 10th. The skin opening has slowly become larger; it is now about a third of an inch in diameter; there is a constant discharge of thin sero-pus. (On several occasions the chimpanzee has been seen to place her hand on the ulcer, and then to lick the discharge from her fingers; this accounts for the implication of the tonsils and intestines.) The skin is undermined around the ulcer, but there is very little thickening of the surrounding tissues.

The general condition is very poor, but she retains her appetite remarkably well; she is much quieter, and now makes no attempt to escape from her cage; she is distinctly thinner and weaker; her lips are pale, her expression anxious, and her coat staring.

December 17th. There has been progressive emaciation and weakness; this morning marked œdema of the eyelids was noticed, which persisted until the end of the experiment.

The mucous membrane of the lips and mouth is extremely pale; the skin of the face and ears has a yellow earthy hue; the muscles are flabby; the appetite is very poor.

The local conditions remain about the same; the opening in the skin of the back is slowly enlarging, and is every morning covered over with dried secretion, but on removal of the scab a small amount of pus can be squeezed out.

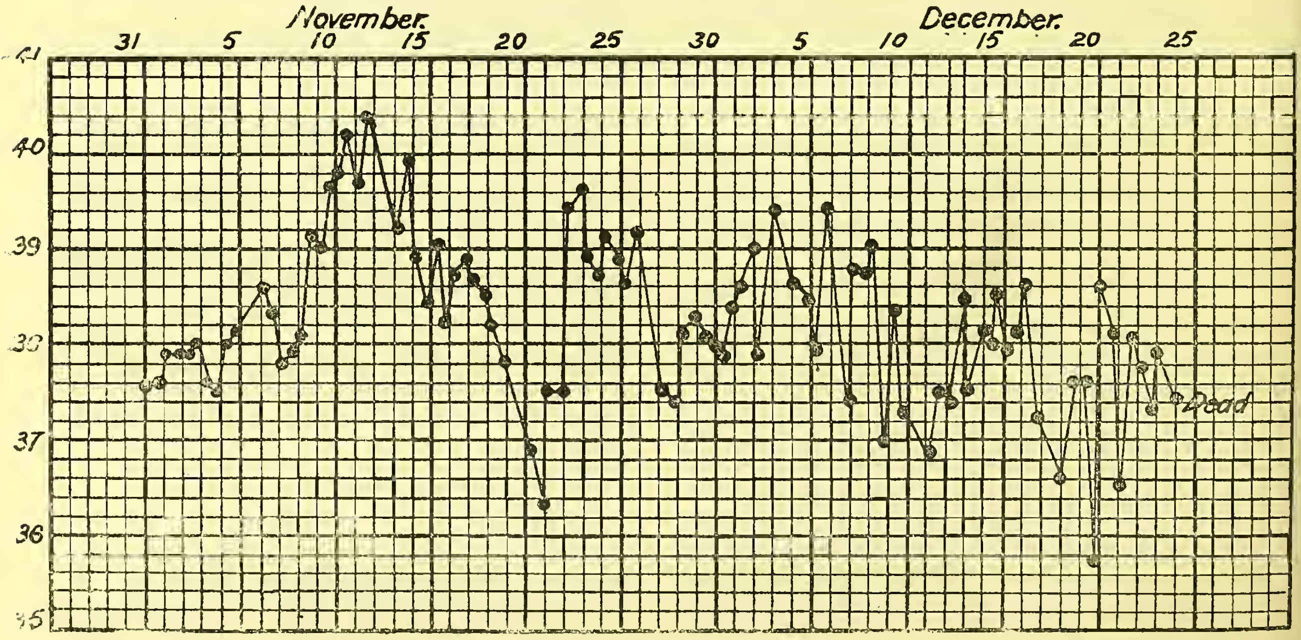
December 22nd. Condition much about the same, but emaciation and weakness more marked. The axillary glands have diminished in size.

December 26th. Died fifty-five days after inoculation.

Weight.

November 7th, 1904	- -	15 lbs. 0 ozs.
November 23rd, 1904	- -	14 lbs. 6 ozs.
December 12th, 1904	- -	13 lbs. 12 ozs.
December 20th, 1904	- -	13 lbs. 4 ozs.
December 26th, 1904	- -	12 lbs. 15 ozs.
Loss in weight - -	-	2 lbs. 1 oz.
Average loss per week	-	4·7 lbs.

Temperature.



POST-MORTEM EXAMINATION

Body.—Very emaciated.

Local Lesion.—At the seat of inoculation, on the right scapula, there was an ulcer a little over half an inch in diameter, with thin undermined edges, which partly enclosed a flattened cavity rather larger than a shilling. The walls of this cavity were smooth, and brownish in colour, and only slightly indurated. In its inner wall and just beneath were several whitish tubercles.

Axillary Glands.—The axillary glands on the right side, seven in number, each the size of a small haricot bean, were enlarged; on section they were found to be tough and fibrous, with caseating nodules.

On the opposite side the axillary glands were equally enlarged, and very similar on section.

A gland lying on a middle cervical vertebra, under the right trapezius, was enlarged to the size of a haricot bean, and on section was dense and fibroid, with caseating areas in the cortex.

In the right posterior triangle, half an inch above the clavicle, and lying partly under the sterno-mastoid, there was a gland the size of a sparrow's egg, which showed on section irregular caseous softened nodules and caseous foci in a translucent fibroid matrix.

Behind the middle of the clavicle on each side there was a series of four small glands, all these showed caseous foci.

In the right anterior triangle, under the angle of the jaw, there was a group of from eight to ten slightly enlarged glands, all of which contained discrete caseous foci.

On the left side there was a similar group; extending downwards along the left carotid artery were three small glands which also showed caseous foci.

There were scattered caseous foci in the submental, submaxillary and subparotid glands.

Inguinal Glands, Iliac Glands.—Were enlarged, and packed with caseous foci.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Was enormously enlarged, measuring five and a half inches by three inches by one and a half inches. Its surface was studded with tubercles, larger than those in the liver, from the margins of which a thin ragged membrane extended, which in places formed a continuous layer over the organ.

Section showed tubercles throughout the organ.

There was a bunch of glands in the hilum of the spleen packed with tuberculous nodules, translucent with caseating centres.

Liver.—Appeared enlarged, and was studded with innumerable tubercles, the largest of which, the size of a pin's head, projected on the surface; section showed the tubercles to be equally numerous throughout the organ.

Kidneys.—Were extremely pale, being a sort of clay colour; fairly numerous minute opaque tubercles were seen in them.

Thorax:

Heart.—Several tubercles were seen on the surface of the right ventricle and on the surface of the right auricle; there were no tubercles on the endocardium.

Pleura.—Normal.

Lungs.—Were packed with dark grey translucent tubercles, with very little caseation about their centres.

Bronchial Glands.—Were enlarged and studded with caseating foci.

Tonsils.—Enlarged, and very irregular on the surface. (Tubercle bacilli found.)

Small Intestine.—The small intestines were examined after they had been preserved in glycerine. All the Peyer's patches were found to contain discrete opaque tubercles, the size of pins' heads; some of the patches contained three or four, others as many as twelve; there were no definite ulcers, but the mucous membrane over several of the tubercles showed a minute opening (a smear was made from one of the tubercles, and tubercle bacilli were found); on the serous surface of the small intestine a few pearly white tubercles were seen.

Meso-Colon.—Somewhat œdematous. Otherwise normal.

Many of the colic glands contained minute tuberculous foci, while those at the root of the mesentery were larger and more severely affected.

Microscopical Examination.

Left Cervical Gland } Moderately numerous tubercle
Left Tonsil } bacilli.

Right Submaxillary Gland.—No tubercle bacilli.

Bronchial Gland.—Very numerous tubercle bacilli.

Axillary Gland.—Numerous tubercle bacilli.

Liver.—Tubercle bacilli fairly numerous.

Cultures were obtained both from the axillary gland and a bronchial gland.

Guinea-Pigs Inoculated.

Guinea Pig 1,400 inoculated with an emulsion of an axillary gland died of general tuberculosis in twenty days.

Guinea Pig 1,401 inoculated with an emulsion from the liver died of general tuberculosis in eighteen days.

PIG 94.

Subcutaneous Inoculation of culture derived from the original material of Virus B. IV.

Inoculated at the same time as Chimpanzee 4 with an equivalent dose of culture.

Dose—1·0 milligramme.

Date—October 31st, 1904.

Weight—November 1st, 1904. 27 lbs.

Killed—December 31st, 1904. 61 days after inoculation.

Clinical History.

The pig was inoculated subcutaneously in the wall of the abdomen on December 31st, 1904.

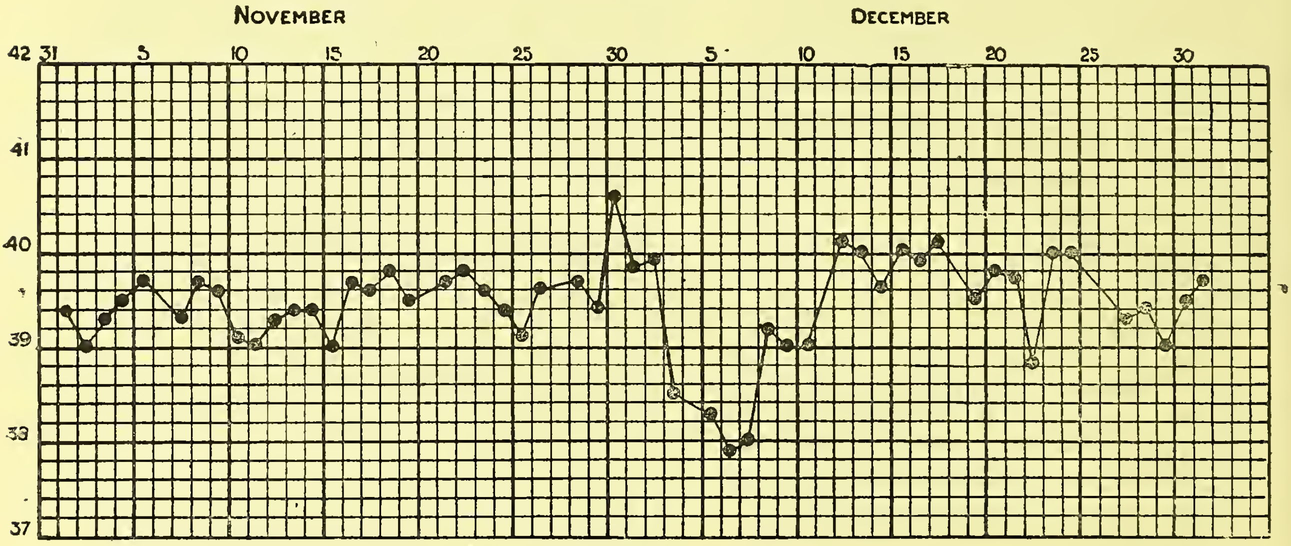
There were no symptoms of illness during the experiment.

Weight.

In the first three weeks there was a gain in weight of 6 lbs.; then for 19 days the weight was more or less stationary; from December 12th to December 27th the animal lost 5 lbs.

	qr.	lbs.
November 1st, 1904 - - - - -	0	27
November 23rd, 1904 - - - - -	1	5
December 12th, 1904 - - - - -	1	7
December 27th, 1904 - - - - -	1	2
Gain in weight on the initial weight -	0	3

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Moderate.

Seat of Inoculation.—At the seat of inoculation, in the mid line of the abdomen, 2 in. posterior to the umbilicus, there was a small irregular tumour measuring roughly 1¼ in. by ¾ in. by ½ in.

On section it was composed of tough greyish white waxy caseated tissue, showing here and there opaque white gritty streaks; the skin over the tumour was slightly adherent, but not infiltrated.

Superficial Inguinal Glands.—In each inguinal region there was a group of three or four enlarged and indurated glands, which showed on section a coarse network of greyish white, somewhat translucent, gritty caseated tissue, infiltrating a firm greyish translucent tissue.

Iliac Glands.—The glands on both sides were similar in appearance to the inguinal glands, but the network of caseated tissue was much finer; the left iliac glands were a little more advanced than the right.

Precrural Glands.—Were slightly enlarged, and showed foci of early caseation.

Abdomen:

Omentum.—Showed some minute transparent points, which were possibly early tubercles.

Peritoneum.—The peritoneal surface of the diaphragm was profusely covered with hard grey miliary tubercles.

Spleen.—About twice the normal in size; showed on the surface numerous slightly projecting grey translucent nodules, the largest 3 mm. in diameter. On section the pulp was crowded with similar nodules, yellow and necrotic in the centre; these had a reddish colour around the margins (probably from enclosed splenic tissue), and so were not easily differentiated from the surrounding splenic pulp.

Liver.—Enlarged, pale, and mottled on the surface with patches of congestion. The capsule was covered with extremely numerous minute transparent foci, which were visible only by reflected light. The substance of the liver was pale, and had the appearance of being closely peppered with minute grey foci, which were just visible to the naked eye.

Portal Glands.—In the small omentum there was a series of five or six enlarged and indurated glands, the largest the size of a filbert, which showed on section opaque caseous streaks and foci (some softened), embedded in a grey translucent matrix.

Lumbar Glands.—Slightly enlarged and indurated, and in a state of early caseation.

Kidneys.—Left kidney showed in the cortex, on the surface and on section, numerous grey translucent tubercles, mostly about the size of mustard seeds. Two or three tubercles were slightly larger, and extended into the cortex as radial streaks.

Right kidney contained numerous small tubercles, similar to those in the left; projecting from its pelvis there was a tense cyst, the size of a bagatelle ball, with thin fibrous walls and clear yellowish watery contents with a urinous odour.

Suprarenal Bodies.—Appeared normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—The lungs were firm and collapsed only partially; they were closely beset with grey translucent tubercles, ranging from 1 to 2 mm. in diameter, a few of which were opaque and gritty in the centre; on the dorsal surfaces the tubercles under the pleura were flattened out, and had in many places become confluent, forming irregular grey areas.

Bronchial Glands.—Two or three times the normal in size; showed on section opaque yellowish white gritty foci.

Mediastinal Glands.—Dorsal mediastinal glands were slightly enlarged, but showed no opaque foci.

Ventral mediastinal glands showed a few early foci.

Pleura.—Along the margins of the last three ribs there were lines of soft pinkish connective tissue outgrowths. On other parts of the parietal pleura there were numerous minute hard tubercles.

The pleura covering the diaphragm presented numerous small tubercles, most of which were surmounted by small transparent fringes.

Around the margins of the tendon of the diaphragm there were some soft growths similar to those on the ribs.

Alimentary Tract.

Tonsils, Pharynx, Small Intestine.—Normal.

Gastric Gland.—Resembled the portal.

Mesenteric Glands.—All the mesenteric glands were enlarged, indurated, and showed on section a fine yellowish white network of caseation.

Ileo-Colic Glands, Colic Glands.—Were similarly affected.

Various Lymphatic Glands.

One left submaxillary, two right submaxillary, and the prescapular glands each showed two or three opaque whitish foci.

Other lymphatic glands were normal.

Microscopical Examination (Smear Preparations).

Left Submaxillary Gland - } Moderate number of
Portal Gland - - - } tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

MANDRILL BABOON 46.

Subcutaneous Inoculation of culture from the original material of Virus B. IV

Dose—1·0 milligramme.

Date—December 14th, 1904.

Found Dead—February 1st, 1905. 49 days after inoculation.

Clinical History.

The baboon was inoculated subcutaneously between the shoulders on December 14th, 1904.

Seven days after inoculation there was a small tumour about the size of a split pea.

This slowly enlarged, and on December 30th, sixteen days after inoculation, was raised, rounded, and 1¼ in. in diameter; a small opening had appeared in the skin over the tumour, through which thick greenish yellow pus exuded.

On January 7th the tumour was a little larger, 1½ in. in diameter, and more prominent and fluctuant; pus was intermittently discharged through the opening. The axillary glands, particularly those on the right side, were felt to be enlarged and softened.

On January 23rd there was a very profuse discharge of pus, and the tumour became smaller.

There was no obvious change in the general health until January 25th, when he was seen to shiver and to have some loss of appetite.

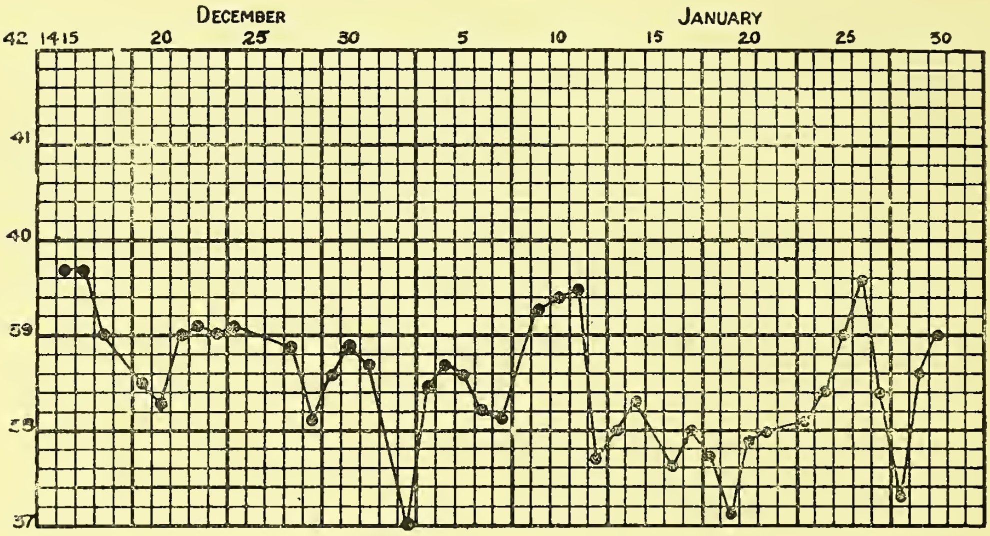
On January 27th his general condition seemed to have improved; the respirations, however, were increased and the appetite remained poor. The tumour was smaller and firmer, the skin being covered with dried discharge; the axillary glands on the right side were large and soft, but not adherent; those on the left side were much smaller.

On February 1st he was found dead, 49 days after inoculation; his condition on the previous day was not such as to lead one to expect this early termination of the experiment.

Weight.

	lbs.	ozs.
December 20th, 1904 - - - -	5	13
January 10th, 1905 - - - -	5	3
January 24th, 1905 - - - -	6	4
February 1st, 1905 - - - -	6	0
Gain in weight on the initial weight - - - - -	0	3

Temperature.



POST-MORTEM EXAMINATION.

Body.—In poor condition, but not emaciated.

Local Leison.—On the right scapula, near the mid line, there was a slightly raised flattened swelling, triangular in outline, measuring one and a half inches along each side. Near one margin there was a small opening, through which thin yellow purulent fluid could by pressure on the swelling be made to exude.

On section the swelling was seen to be an abscess, from which most of the contents had been discharged; the outer wall was formed by skin, lined internally by a thin layer of caseo-pus; the inner by breaking down caseated tissue separated from the muscles by a thin layer of fibrous tissue; the inner wall was 3 millimetres thick.

Axillary Glands.—In the right axilla there was a group of seven enlarged glands. The two largest had fused together to form a mass, 1 in. by 1 in. by ½ in., which on section consisted throughout of thick greenish yellow caseo-pus. The other glands were the size of peas and contained discrete softened caseous nodules up to 3 mm. in diameter.

On the left side there was one gland, the size of a broad bean, the substance of which was almost entirely replaced by yellow caseo-pus. Other small glands in this neighbourhood were normal.

Cervical Glands.—Superficial and deep; normal. A mid cervical gland on the right side, appeared slightly enlarged, but there were no foci of caseation.

Abdomen :

Omentum, Peritoneum.—Normal.

Spleen.—Two or three times the normal in size, was packed with yellow caseous and softened nodules, ranging in size from a large shot to a pea; many of the nodules projected on the surface, a few being surrounded by fringes of fibrin.

The glands in the gastro-splenic omentum were slightly enlarged, and contained softened caseous nodules.

Liver.—Pale and soft. Showed on the surface, under the capsule, nine to twelve softened caseous tubercles, varying in size from a mustard seed to that of a No. 4 shot. On section of the liver similar tubercles were seen sparsely scattered throughout the substance.

A small gland in the hilum of the liver, and two slightly larger ones in the small omentum, were almost entirely caseous.

Coeliac Glands.—Two coeliac glands contained each a softened caseous nodule.

Iliac Glands, Lumbar Glands.—Normal.

Kidneys.—Right kidney showed on the surface six grey tubercles, slightly opaque in the centre; on section two tubercles were seen in the depth of the cortex.

Left kidney showed five tubercles on the surface. In the depth of the cortex there were two caseous nodules 2 by 3 mm. in diameter, besides two or three minute tubercles.

Suprarenal Bodies, Stomach, Intestines.—Normal.

Mesenteric Glands.—Were not enlarged. Two contained caseous foci.

Ileo-Colic Glands.—An ileo-colic gland showed three or four caseous foci.

Colic Glands.—Normal.

Thorax:

Heart, Pericardium.—Normal.

Lungs.—The right lung contained about two dozen hard, caseating tubercles, ranging in size from a pin's head to a small pea. There were similar tubercles in the left lung, but in smaller number.

Bronchial Glands.—A gland below the left bronchus contained a softened caseous nodule 3 mm. in diameter. Other bronchial glands appeared normal.

On the right side of the vertebral column, about the level of the sixth to the eighth ribs, there was a mass the size of a small bean, composed of greenish-yellow pus, surrounded by a thin fibrous capsule.

Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Brain, Spinal Cord, Testicles, Inguinal Glands.—Normal.

Microscopical Examination (Smear Preparations).

Mesenteric Gland.—Five tubercle bacilli seen.

Liver.—Moderately numerous tubercle bacilli.

VIRUS B V.

November 19, 1903.

MESENTERIC GLANDS.

Cow when killed, was found to have disease of the lung and mesenteric glands. A piece of the lung had on its surface two large growths containing in the interior yellow gritty foci, and showed in the substance under the pleura patches of tuberculous pneumonia.

TABLE 5A.

VIRUS B V.

MESENTERIC GLANDS.

4,500,000 T.B. (in 2·32 c.c.) inoculated into each large animal.

GOAT 2.

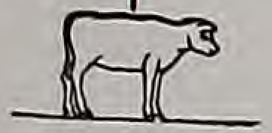
Subcutaneous.

Died, January 13, 1904.
(54 days.)

P.M.—Local ulcer; caseous prescapular gland; other adjacent glands slightly affected; two minute foci in liver, three in left kidney, 20–24 tubercles in spleen; lungs riddled with caseous nodules; caudal lobes honeycombed with cavities.

G. Ps. from prescapular gland.

792	210	Died	35 days	G.T.	S.
793	190	„	39 „	G.T.	S.
794	140	„	22 „	T.	I.



CALF 144.

Subcutaneous.

Killed, February 5, 1904.
(78 days.)

P.M.—Local tumour; neighbouring glands tuberculous; caseous tubercles in spleen, liver and lungs.

GUINEA-PIGS.

Pre-scapular gland.	834	Died	3 days	Acute Infection.	S.
	835	„	5 „		S.
	836	„	32 „	G.T.	I.
Muscle	837	Killed	71 „	No T.	I.

RABBITS.

11	Died	76 days	G.T.	S.
12	„	5 „	V.S.T.	I.P.

GUINEA-PIGS.

706	Killed	46 days	G.T.	S.
707	„	46 „	G.T.	S.
708	„	46 „	T.	S.
709	Died	21 „	T.	I.
710	„	18 „	T.	I.
711	„	30 „	G.T.	Intra-thoracic

SHORTHORN BULLOCK 90.

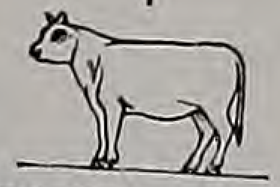
Subcutaneous.

Killed, April 13, 1904.
(140 days.)

P.M.—Multilocular abscess cavity; prescapular gland beset with caseous and softened nodules; a few caseous nodules in mediastinal and bronchial glands.

GUINEA-PIGS.

Prescapular Gland.	933	Died	44 days	G.T.	S.
	934	„	43 „	G.T.	S.
	935	„	29 „	G.T.	I.
Mediastinal Gland.	936	„	41 „	G.T.	S.



JERSEY HEIFER 80.

Subcutaneous.

Killed, January 19, 1904.
(62 days.)

P.M.—Local caseous tumour; left prescapular and prepectoral glands tuberculous; a few tubercles in spleen, liver and lungs; thoracic glands and a pancreatic gland affected.

GUINEA-PIGS.

Prescapular gland	810	420	Died	66 days	G.T.	S.
	811	410	„	29 „	G.T.	I.
Spleen	812	420	„	75 „	G.T.	S.
Foetal Spleen	813	170	Killed	88 „	No T.	S.
Milk	816	160	„	88 „	G.T.	S.

VIRUS B 5.

(November 19, 1903.)

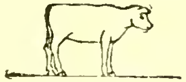
CULTURE INOCULATIONS.

Animals inoculated with culture obtained from Guinea-pig 711, inoculated with original material.

November 25, 1904.

The culture used was 20 days old, 5th Generation.

The total age of the culture was 371 days.

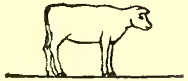


CALF 224.
Subcutaneous.
Dose : 50 mg.
Died, January 6, 1905.
(22 days.)

P.M.—Large local lesion ; general tuberculosis.

BULL 88.
Subcutaneous.
Dose : 50 mg.
Killed, January 9, 1905.
(45 days.)

P.M.—Very large local lesion ; general tuberculosis (not so extensive as in Calf 224).



CALF 202.
Subcutaneous.
Dose : 0·01 mg.
Killed, February 17, 1905.
(84 days.)

P.M.—Small fibroid caseo-calcareous lesion ; caseous nodules in the prescapular glands ; no tuberculosis elsewhere.

GOAT 28.
Subcutaneous.
Dose : 0·01 mg.
Died, February 24, 1905.
(91 days).

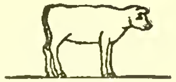
P.M.—General tuberculosis.

Calves inoculated with culture derived from Heifer 80.

Inoculated October 24, 1905.

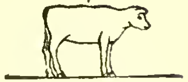
The culture used was 21 days old, 19th Generation.

The total age of the culture was 642 days.



CALF 352.
Subcutaneous.
Dose : 10 mg.
Died, December 3, 1905.
(40 days.)

P.M.—General tuberculosis.



CALF 354.
Subcutaneous.
Dose : 10 mg.
Killed, January 22, 1906.
(90 days.)

P.M.—General tuberculosis.

Inoculated March 14, 1905.

The culture used was 20 days old, 10th Generation.

The total age of the culture was 418 days.

CALF 246.
Subcutaneous.
Dose : 50 mg.
Killed (dying), April 30, 1905.
(47 days.)

P.M.—Caseo-necrotic local lesion ; general tuberculosis.

CALF 144.

Subcutaneous inoculation of an emulsion made from the original material of Virus B V.

Volume of Emulsion—2·32 cc. diluted to 10 cc. with normal saline.

Number of Tubercle Bacilli inoculated—4,500,000.

Date—November 20th, 1903.

Weight at inoculation—2 cwt.

Killed—January 21st, 1904. 62 days after inoculation

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on November 20th, 1903.

Ten days later there was a tender, slightly projecting swelling measuring 3 in. by 2¼ in. ; the prescapular gland was slightly enlarged.

On the twentieth day the tumour measured 4 in. in diameter, and was prominent, circular in outline, and adherent to the skin ; the prescapular gland was 4 in. in length. Subsequently the tumour and the gland increased in size, but only to a slight extent.

The health of the animal remained good throughout the experiment.

Temperature.

The temperature did not fluctuate beyond the normal.

Weights.

During the first fortnight the calf gained 21 lbs. in weight ; in the third week there was a loss of 4 lbs. ; subsequently there was a steady increase.

	cwts.	qrs.	lbs.
November 24th, 1903	2	0	0
December 8th, 1903	2	0	21
December 16th, 1903	2	0	17
January 21st, 1904	2	2	3
Gain in weight		2	3
Rate of gain per week			6·5

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a somewhat prominent firm tumour, measuring 3½ in. by 2¾ in. by 3½ in., which on section was found to consist entirely of dense yellowish necrotic tissue, containing calcareous particles in the peripheral parts only ; near the skin there was a small patch of softening. The tumour was fixed by fibrous union to the skin and to the muscle. The superficial layer of muscle, in contact with the tumour, contained numerous discrete yellow gritty nodules from 1 to 3 mm. in diameter ; the deeper layers of the skin showed a few scattered yellow foci. At the inferior extremity of the tumour there was a group of yellow nodules closely set in pale fibroid tissue.

Left Prescapular Gland.—Weighed 8 ozs., and measured 4½ in. by 2¾ in. by 2⅓ in. On section the whole of the gland was closely beset with yellow slightly gritty tubercles ; the cortex was irregularly thickened, in two places forming fibroid wedges which penetrated the cortex ; around these the tubercles were continuous. In the tissues surrounding the gland there were one or two isolated tubercles.

Right Prescapular.—2½ in. by 1in. by ⅓ in. slightly œdematous, but free from tubercle.

Prepectoral Glands.—The superficial prepectoral gland was enlarged to the size of a walnut, and indurated; the capsule was greatly thickened ; the gland substance was completely replaced by firm caseating tissue, from which the thickened capsule could be easily separated ; the caseated tissue was calcareous, chiefly around the hilum.

A second prepectoral gland showed a group of yellow foci affecting half the substance.

A third deep prepectoral was apparently normal.

Cervical Glands.—The lower cervical gland on the left side was very large (2 in. by 1¼ in. by 1 in.), and on section was packed with gritty tubercles, which in more than half the gland had become confluent ; the capsule was much thickened.

The gland on the opposite side was normal.

Mid and upper cervical glands on both sides were normal.

Abdomen :

Peritoneum and Omentum.—Normal.

Spleen.—Weighed 14 ozs. Normal on the surface. Showed in the pulp about a dozen spherical nodules. from 2 to 4 mm. in diameter, some of which were perceptibly calcareous.

Liver.—Weighed 6 lbs. Showed beneath the capsule, embedded in the parenchyma, whitish nodules (twenty-four in all) from 2 to 5 mm. in diameter ; also one larger nodule on the anterior surface, 1·5 by 1 cm. in diameter. When cut into the nodules appeared to consist of dense fibroid tissue containing yellow foci, many of which were gritty.

Similar nodules occurred at wide intervals in the depth of the liver.

Hepatic Lymphatic Glands.—Three in number ; one slightly enlarged: showed scattered tuberculous foci in the cortices.

Gall Bladder.—Normal.

Kidneys.—Both normal.

Suprarenal Bodies.—Normal.

Pancreas.—Normal.

Large and Small Intestines.—Normal.

Gastric Glands.—One small gastric gland, between the second and third stomachs, was closely beset with caseous foci. Other gastric glands were normal.

Mesenteric and Colic Glands.—Normal.

Cœliac Glands.—Two cœliac glands were slightly enlarged ; each contained at one extremity a small group of caseous gritty foci.

Thorax :

Heart and Pericardium.—Normal.

Pleura and Diaphragm.—Both surfaces normal.

Lungs.—Uniformly distributed throughout both lungs there were numerous nodules (some hundreds) ranging in size from 2 to 8 or 10 mm. in diameter ; the subpleural nodules formed rounded elevations on the surface, and two or three of the larger ones filled entire lobules (these being in the thinned out portions of the lung). The nodules were all caseous in the centre and many showed distinct fibrous walls : some of the larger ones had softened calcareous contents.

The fringes around the margins of the lungs were not hypertrophied, and were free from tubercle.

Mediastinal Glands.—The dorsal caudal gland was enlarged, and measured 6 in. by 1¾ in. by ⅔ in. On section the tissue was firm and congested : the cortex was filled with yellow gritty tubercles, which in many places had coalesced to form fairly large caseo-calcareous nodules.

Two small glands anterior to this, the largest the size of a filbert, contained small caseo-calcareous masses.

A gland in the anterior part of the dorsal mediastinum, measuring 2½ in. by 1¼ in., closely resembled the long caudal gland.

Bronchial Glands.—The left bronchial gland was enlarged to four or five times the normal, and beset with caseo-calcareous nodules.

The right bronchial gland was similarly, but not so extensively affected.

The peribronchial glands on each side were slightly enlarged, and showed caseous foci.

Two glands just within the entrance of the thorax, one on each side of the trachea, were apparently normal.

A small ventral mediastinal gland was deeply congested, and contained a few minute caseous foci.

A second ventral gland was normal.

Tongue, Tonsils and Pharynx.—Normal.

Posterior, Pharyngeal, Submaxillary and Parotid Lymphatic Glands.—Normal.

Larynx and Trachea.—Normal.

Ovaries, Fallopian Tubes and Uterus.—Normal.

Mammary and Supramammary Lymphatic Glands.—Normal.

Iliac, Sacro-Iliac and Lumbar Glands.—Normal.

Right and Left Precrural Glands.—Normal.

Right and Left Popliteal.—Normal.

Right and Left Gluteal.—Normal.

Right and Left Ischiatic.—Normal.

Right Axillary and Prepectoral Glands.—Normal.

The skin on the right side of the neck, over the site of the inoculation of tuberculin, showed thick adherent scales of desquamated epithelium, and one or two small erosions.

Microscopical Examination.

Smears from :—

The Prescapular Gland Emulsion.—Tubercle bacilli moderately numerous.

Lung.—Tubercle bacilli (six seen).

Spleen.—Tubercle bacilli (four seen).

Gastric Gland.—No tubercle bacilli.

Guinea-pigs Inoculated.

Three guinea-pigs were inoculated with an emulsion from the prescapular gland; two died of an acute infection and the other of general tuberculosis. A guinea-pig inoculated with muscle remained healthy.

HEIFER 80.

Subcutaneous inoculation of an emulsion made from the original material of Virus B V. (Mediastinal Gland).

Volume of Emulsion—2·32 cc., diluted to 10 cc. with normal saline.

Number of Bacilli inoculated—4,500,000.

Date—November 20th, 1903.

Weight at inoculation—5 cwt. 2 qrs. 11 lbs.

Killed—January 21st, 1904. 62 days after inoculation.

Clinical History.

The heifer was inoculated subcutaneously on the left side of the neck on November 20th, 1903.

Ten days later there was an elongated flat thickening 3½in by 2 in.

On the twentieth day the tumour measured 5 in. by 3½ in.; it was prominent, firm, and adherent to the skin.

After this date the tumour remained practically unchanged.

During the early part of the experiment the prescapular gland was not felt on account of the large amount of surrounding fat. At the end of the third week it was definitely enlarged, and at the end of the fourth measured about 5 in. in length.

The animal showed no symptom of illness during the experiment.

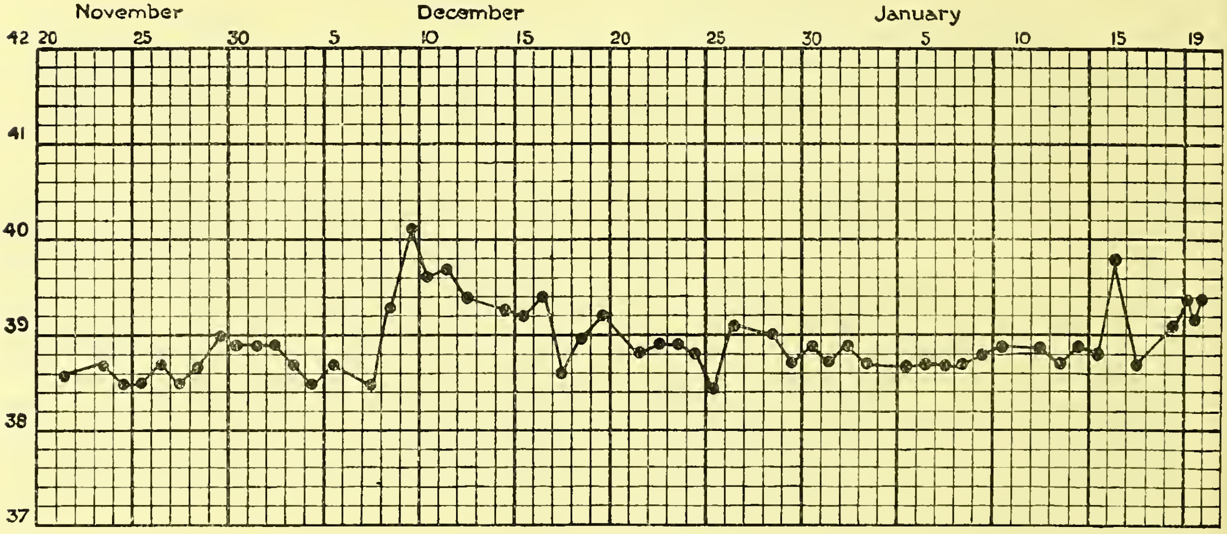
Weights.

During the first fortnight there was a gain in weight of 1 qr. 26 lbs.; in the third week the animal lost 14 lbs.; subsequently there was a steady increase in weight week by week.

	cwts.	qrs.	lbs.
November 24th, 1903 - -	- 5	2	11
January 19th, 1904 - -	- 6	3	0
Gain in weight during the experiment -	- 1	0	17
Average weekly increase -	-		14·3

Tuberculin Test.—January 19th, 1904, 60 days after inoculation. Positive. Rise of temperature 1·3°C.

Temperature.



Heifer 80

POST-MORTEM EXAMINATION.

Carcass.—In good condition and very fat.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a projecting tumour, measuring 5½ in. in length, 3 in. in breadth and 1¾ in. in thickness, and which weighed with the skin and the thin layer of muscle to which it was attached, 13 ozs.

When cut into, the tumour showed in the central portion dense yellow caseating tissue, of a firm consistence and not perceptibly calcareous. Between the central portion and the skin on the one hand and the muscle on the other, there was firm pale translucent tissue studded with small caseating tubercles.

In the part of the muscle nearest to the tumour there were scattered a number of translucent tubercles, some of which were just beginning to caseate. Similar tubercles here and there penetrated the deeper layers of the skin.

Left Prescapular Gland.—Weighed 6 ozs. and measured 4½ in. by 2½ in. by 1¼ in. On longitudinal section the cortex was seen to contain everywhere numerous more or less discrete yellow foci. Towards the superior extremity the cortex was penetrated by a dense fibroid wedge, around which the tubercles were confluent. In the midst of the lower two-thirds of the gland there was a second cicatricial area, ¾ in. in diameter, and less than an ⅛ in. in thickness. This was immediately surrounded by a zone of compact caseating tissue, remotely by separate caseous foci; the cicatricial tissue itself contained a few scattered yellow points.

The caseous foci in one part of the cortex were very deeply congested.

Right Prescapular Gland.—Enlarged to twice the normal, was on section very congested and œdematous, but showed no tubercle. The tissues around the gland were œdematous.

Prepectoral Glands.—The superficial prepectoral gland measured 1½ in. in diameter and 1 in. in thickness. On section, at the hilum there was a wedge of fibroid tissue similar to that seen in the prescapular gland; the fibrous tissue showed yellow foci, and was surrounded by a semicircular zone of confluent caseous tubercles; the rest of the gland was œdematous, and was studded with caseous foci.

A deeper prepectoral gland appeared to be normal.

(No tubercle bacilli were seen in a smear made from the latter gland.)

Right Prepectoral Glands.—Slightly œdematous; otherwise normal.

Right and Left Axillary Glands, Anterior, Middle and Posterior Cervical Glands.—Normal.

At the seat of inoculation of tuberculin, on the right side of the neck (forty-one hours previously) there was a moderate amount of œdema.

Abdomen:

Omentum, Peritoneum.—Normal.

In the omentum and around the kidneys there were large deposits of fat.

Spleen.—1 lb. 4 ozs. Normal on the surface. Showed on section three yellow caseating tubercles, 2 mm. and less in diameter.

Liver.—Showed on the anterior surface, beneath the capsule, three greyish white nodules, 2 to 3 mm. in diameter; the posterior surface was normal. In the depth of the liver substance two similar nodules were seen, one 2 mm., the other 4 mm., in diameter. Each nodule showed a minute central caseous focus.

Gall Bladder.—Normal.

Hepatic Lymphatic Glands.—(Three in number), showed no naked eye evidence of tubercle.

A lymphatic gland lying along the posterior border of the pancreas on the left side was œdematous and congested, and contained at one end a group (eight to ten) of small yellow tubercles.

Kidneys :

Left.—10 ozs. Showed on the surface a patch of congestion (no tubercle bacilli were found in a smear made from the cortex in this situation)—otherwise normal.

Right.—11 ozs. Showed in the cortex near the surface a suspicious looking grey point. (No tubercle bacilli found.)

Suprarenal Bodies.—Both normal.

Thorax :

Heart, Pericardium, Pleura (Visceral and Parietal).—Normal.

Lungs.—Sparsely scattered throughout each lung there were nodules ranging in size from a small shot to a large pea ; from twenty to twenty-four were counted on the surface of the lung. The nodules were very congested, and contained yellow foci of caseation. They were less numerous in the depth of the lung than on the surface. In the right cephalic lobe there were several collapsed lobules.

No parasites were seen in the bronchi.

Mediastinal Glands.—The long dorsal gland, not obviously enlarged, showed in the cortex, scattered at wide intervals, yellow tubercles, the size of pins' heads. A gland anterior to this contained six to eight caseous foci ; a third gland anterior to the latter contained three or four foci, and a caseating nodule 2 mm. in diameter.

Bronchial Glands.—The left bronchial glands (two in number) contained numerous caseating tubercles, each the size of a pin's head.

The right bronchial gland was similarly affected.

The peribronchial glands also showed caseous foci.

The glands in the anterior part of the dorsal mediastinum appeared normal.

Ventral mediastinal glands were normal.

A gland near the centre of the diaphragm, in the mediastinal pleura, was normal.

Tongue, Tonsils, Pharynx, Larynx, Submaxillary Lymphatic Glands, Posterior Pharyngeal, Thymus, Thyroid, Salivary Glands.—Normal.

Intestines.—Normal throughout.

Iliac Glands, Lumbar Glands.—On each side were normal in size and appearance.

Mammary Gland, Supramammary Lymphatic Glands.—Showed no tubercle.

The milk sinuses contained a small quantity of thick yellowish turbid fluid. (No tubercle bacilli were found in it.)

Uterus.—Contained a five months' old fœtus.

The ovaries, internal surface of uterus, and placenta, showed no tubercle.

The organs and glands of the fœtus were also free from tubercle.

(An emulsion was made from the spleen of the fœtus, and inoculated into a guinea-pig.)

Precrural, Popliteal, Gluteal, Ischiatic, and *Parotid Lymphatic Glands.*—Normal.

Microscopical Examination.

Smears from :—

Left Prescapular Gland (Emulsion).—Tubercle bacilli (moderate number).

Kidney (right and left)
Mediastinal Gland (dorsal) } No tubercle bacilli.

Lung
Spleen } No tubercle bacilli.
Liver

Left Prepectoral Gland (deep)
Gland near Pancreas } No tubercle bacilli.
Fluid from Mammary Gland Sinus

Guinea-pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from the prescapular gland, one subcutaneously, the other intraperitoneally, died of general tuberculosis in 66 and 29 days respectively.

A guinea-pig inoculated with an emulsion made from the spleen and another inoculated with some of the fluid from the mammary sinuses died of general tuberculosis.

A guinea-pig inoculated with an emulsion of the spleen of the fœtus remained healthy.

SHORTHORN BULLOCK 90.

Subcutaneous inoculation of an emulsion made from the original material of Virus B V.

Amount of Emulsion inoculated—2·32 cc. diluted to 10 cc. with sterile normal saline.

Dose of Tubercle Bacilli—4,500,000.

Date—November 20th, 1903.

Weight at inoculation—8 cwt. 2 qrs. 16 lbs.

Killed—April 13th, 1904. 140 days after inoculation.

Clinical History.

The bullock was inoculated subcutaneously on the left side of the neck on November 20th, 1903.

Ten days later there was a slightly raised swelling 3in. by 2½ in.

On the twentieth day the tumour measured 3½ in. by 2½ in. and was more prominent; it was firm and had abrupt well defined margins; the skin was moveable over it.

The tumour remained stationary in size for some time: it then underwent softening, and became a little larger, more prominent and rounded.

The prescapular gland was felt to be slightly enlarged 10 days after inoculation; subsequently it became larger and then diminished in size; on account of the large amount of surrounding fat it was impossible to measure the gland accurately.

The animal remained in good health throughout the experiment.

Temperature.

The temperature rose on the 49th day to 39·8°C.; with this exception the temperature was normal throughout.

Weights.

The animal was weighed every week and showed an almost uniformly steady increase in weight.

	cwts.	qrs.	lbs.
November 24th, 1903 - -	8	2	16
April 12th, 1904 - - -	10	2	10
Gain in weight during the experiment -	1	3	22
Average weekly increase -			10·8

Tuberculin Test.

April 7th, 1904. 134 days after inoculation. Positive. Rise of temperature 2·5°C.

POST-MORTEM EXAMINATION.

Carcass.—In fine condition; very fat.

Local Lesion.—On the left side of the neck there was a prominent fluctuant swelling, 4½ ins. long, 3 in. broad, and 2 in. thick. The skin was slightly adherent over the central portion of the tumour, but not infiltrated. Between the skin and the tumour at this point there were several small isolated yellow nodules. The tumour was intimately adherent to the aponeurosis of the muscle on which it lay, but there were no deposits of tubercle in the muscle substance.

When cut into the tumour was seen to be made up of a number of cysts of various sizes, filled with thick creamy yellow pus. The majority of the cysts communicated one with another, and many of the larger ones were crossed by slender fibrous trabeculæ. The walls of the cysts were thin and fibrous, and were lined by pinkish ill-formed granulation tissue; on the internal surfaces of some of the cavities small yellow softened nodules projected.

Left Prescapular Gland.—Weighed 1½ ozs., and measured 3¼ in. by 1¼ in. by (nearly) 1 in.

On section one half of the gland was seen to be beset with discrete caseous nodules, from 2 to 3 mm. in diameter; a few of these nodules were softened, and all contained calcareous grains in their central parts. In addition to the smaller nodules there were three or four larger ones, ranging in size from that of a pea to that of a marble; these were filled with thick caseo-pus, and were surrounded by a delicate fibrous capsule (calcareous grains were detected in this pus, as well as in that from the local tumour, when rubbed between the finger and thumb).

The other half of the gland was normal, except for one softened nodule, the size of a small marble, and a group of small caseous nodules, some of which had broken down and coalesced.

Left Prepectoral Glands, Left Axillary Glands, Lower Cervical Glands.—Normal.

Right Prescapular Gland.—Weighed 2 ozs. and measured 4 in. by 2 in. by 1 in. On section was œdematous and intensely hæmorrhagic.

At the site of inoculation of tuberculin (six days previously) on the right side of the neck, there was a large area of congestion and œdema.

Right Prepectoral Glands, Right Axillary Glands, Right Lower Cervical Glands.—Normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen (2 lbs. 11 ozs.), *Liver* (13 lbs. 8 ozs.), *Left Kidney* (1lb. 6 ozs.), *Right Kidney* (1 lb. 8 ozs.)—Normal on the surface and on section.

Suprarenal Bodies.—Normal.

Intestines (*Large and Small*).—Normal throughout.

Gastric Glands, Mesenteric Glands, Colic Glands.—Normal.

Thorax:

Heart, Pericardium.—Normal.

Lungs.—Several of the alveoli in the right cephalic lobe were collapsed; otherwise the lungs were everywhere perfectly normal.

Pleuræ.—Normal.

Thoracic Gland.—The caudal mediastinal gland was double; the right half contained five, the left fourteen firm caseous nodules, from 2 to 3 mm. in diameter. Two glands anterior to this contained ten similar nodules, whilst the left bronchial showed four, and the right bronchial one; all the nodules were gritty in the centre.

Several small glands in the anterior part of the dorsal mediastinum, as well as some along the œsophagus were normal.

Left peribronchial gland normal.

Ventral mediastinal glands and glands on diaphragm were normal.

Various Lymphatic Glands:

Iliac, Sacro-Iliac, Lumbar.—Were deeply congested, but showed no sign of tubercle.

Ischiatic, Gluteal, Popliteal, Precrural, Cervical, Parotid, Submaxillary, Retropharyngeal, Renal, Pudic, Portal.—Normal.

Tongue, Tonsils, Larynx, Pharynx.—Normal.

Microscopical Examination.

Smears from:—

Pus from Local Lesion.—Three tubercle bacilli.

Prescapular Gland (Emulsion).—Four tubercle bacilli.

Mediastinal Gland (Emulsion).—No tubercle bacilli.

Guinea-pigs Inoculated

Two inoculated from the prescapular gland and two from a mediastinal gland died of general tuberculosis in from 29 to 44 days.

GOAT 2.

Subcutaneous inoculation of an emulsion made from the original material of Virus B V.

Volume of Emulsion—2·32 cc. diluted to 10 cc. with normal saline.

Number of Tubercle Bacilli inoculated—4,500,000.

Date—November 20th, 1903.

Weight, 4 days after inoculation—1 qr. 26 lbs.

Died—January 13th, 1904. 54 days after inoculation.

Clinical History.

The goat was inoculated subcutaneously on the left side of the neck on November 20th, 1903.

Ten days later there was a slightly raised tumour $1\frac{1}{2}$ in. in diameter; the left prescapular gland was a little enlarged.

The tumour increased in size, and during the first three weeks was indefinite in outline.

On December 19th it had become more circumscribed and was hemispherical and about 3 in. in diameter; the centre of the tumour was softened and the skin over it seemed on the point of bursting.

On December 23rd the tumour burst, and thin pus was discharged. The ulcer so formed enlarged, and finally the tumour was represented by a large tuberculous ulcer.

The prescapular gland attained its maximum, 3 in. in length, at the end of the third week.

The temperature rose eight days after inoculation, and two days later the animal had a rigor and was obviously seedy. She was unwell for a few days, and then her health improved.

On December 23rd she was not so well again; the respirations were increased, and she appeared to be losing flesh. She now rapidly became ill. There was progressive emaciation and weakness, and the respirations during the last week of life were very hurried.

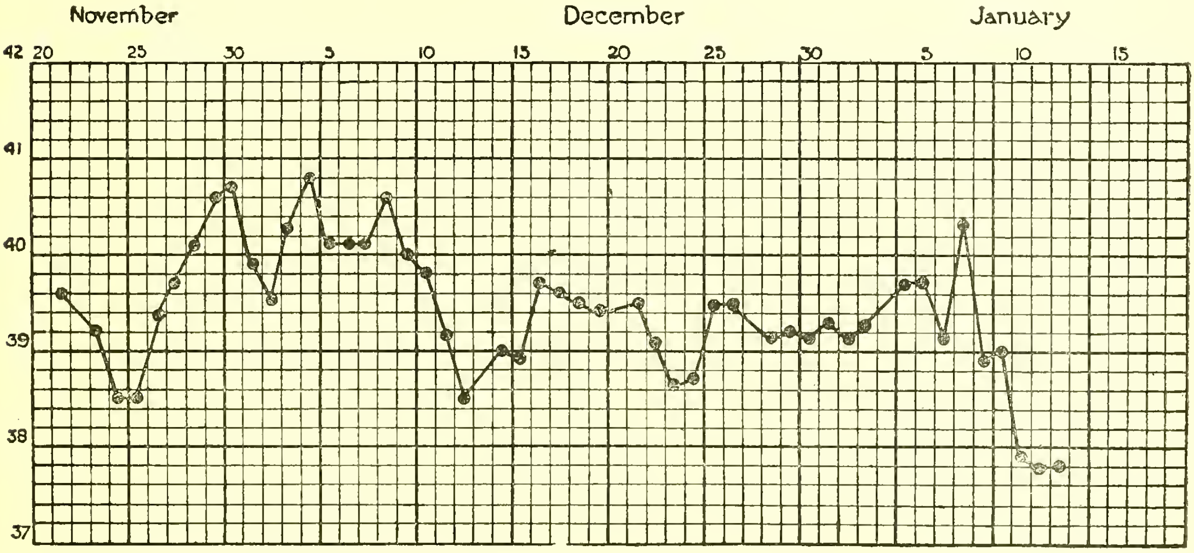
Weights.

During the first five weeks the weight was practically stationary; during the last three weeks there was a steady decline.

	qr.	lbs.
November 24th, 1903 - - - -	1	26
December 1st and 8th - - - -	1	22
December 16th and 22nd - - -	1	26
December 29th, 1903 - - - -	1	21
January 5th, 1904 - - - - -	1	16
January 12th, 1904 - - - - -	1	11

Loss in weight, 15 lbs.

Temperature



POST-MORTEM EXAMINATION.

Carcass.—Greatly emaciated.

At the Seat of Inoculation.—On the left side of the neck, there was an irregular ulcer 3 in. by 2 in., and about a third of an inch deep; the skin surrounding it was considerably undermined and deeply fissured, forming loose flaps, the free edges of which were thickened with dried secretion. The floor of the ulcer, beneath the overhanging skin, showed a thin layer of yellow pus, but where exposed to the air it was covered with a dry cracked crust. The base of the ulcer was formed by the superficial muscles, which contained here and there yellow caseous foci.

In the subcutaneous tissues between the ulcer and the mid line of the neck there was a flattened mass, two inches in diameter and a quarter of an inch thick, of firm greyish white caseating tissue, very slightly gritty; the skin over it was adherent, but not ulcerated.

A lymphatic vessel lying between the ulcer and the prescapular gland was thickened, and showed scattered caseous nodules.

Prescapular Gland.—Weighed about an ounce, and measured $2\frac{3}{4}$ in. by $1\frac{1}{2}$ in. by $\frac{1}{2}$ in. On section it cut with a gritty sensation, and consisted throughout of firm greyish white caseating tissue, presenting here and there minute yellow gritty foci.

Prepectoral Glands.—In the prepectoral region a gland the size of a small pea showed a caseous mass affecting more than half the substance. A second gland, of the same size, more deeply situated, showed no tubercle.

A gland in front of the trachea, near the entrance to the thorax, contained three small caseous foci; a small gland posterior to this was unaffected.

Cervical Glands.—Two upper cervical glands, one on each side of the anterior end of the trachea, were normal in appearance.

A mid cervical gland on the right side was normal on section (on the left side in this region no gland was found).

Right Prescapular Gland.—The size of a broad bean, showed minute caseous foci and two caseous masses, one 1 cm., the other 0·5 cm. in diameter.

Axillary Glands.—Right and left axillary glands were normal in size and appearance.

Right Prepectoral Gland.—Normal.

Abdomen:

Omentum.—Contained a considerable amount of fat, and was free from tubercle.

Peritoneum.—Everywhere normal.

Spleen.—Weighed one ounce. Normal on the surface. On section its pulp was soft, and contained from twenty to twenty-four yellow nodules about the size of millet seeds.

Liver.—Weighed 1 lb. 1 oz. On the posterior surface, beneath the capsule, a minute yellow point was seen. On section the tissue of the liver was dark red, and contained one yellow tubercle the size of a mustard seed.

Gall Bladder.—Normal.

Glands in Hilum of Liver.—(Six or seven in number), ranging in size from a French bean downwards, showed on section yellow caseous nodules from 1 to 2 mm. in diameter, all remaining discrete.

Kidneys :

Left.—Weighed a little over 2 ozs. Showed on stripping off the capsule three minute translucent foci in the cortex. Otherwise normal.

Right.—2¼ ozs. Normal on the surface and on section.

Suprarenal Bodies.—Normal.

Thorax :

No fluid in pericardium.

Heart.—Muscle substance and valves were normal.

Pleura.—Everywhere normal.

Lungs.—The lungs were deeply congested, particularly the right (the goat after death lay on the right side) ; pieces floated in water ; the anterior ends of the cephalic lobes were emphysematous. Over the surface of both lobes, beneath the pleura, there were numerous nodules from 1 to 3 mm. in diameter ; these were yellow in colour, irregular in outline, and in many places confluent. Some projected slightly from the surface, and several groups of nodules were surrounded by dark red congested zones. Most of the nodules in the posterior halves of the caudal lobes show a dark ring around a yellow central part (these when cut into were seen to contain small cavities) ; near the margins of those lobes were a few emphysematous blebs.

On section the posterior two-thirds of the caudal lobes were honeycombed with thin-walled cavities from 2 to 3 mm. up to 1 cm. in diameter ; the larger cavities were irregular in shape, and were formed by the confluence of several smaller ones ; the walls of the cavities were smooth, and were covered with a layer of muco-pus ; many contained a detached or loosely attached mass of caseous material. In other parts of the lungs the caseous nodules were solid throughout, but here and there were scattered small cavities similar to those in the caudal lobes. The lung tissue between the nodules was congested, but not airless.

The fringes around the margins of the lungs showed no tubercles.

Glands in the Dorsal Mediastinum.—The long caudal gland measured 4½ in. by ⅗ in. ; at short intervals throughout the cortex there were small irregular nodules and masses of caseating tubercle.

Two glands anterior to this contained numerous small irregular yellow nodules.

Bronchial Glands.—Appeared to be enlarged, and on section contained similar nodules.

A peribronchial gland on the left side was similarly affected.

A small gland on the œsophagus was normal.

Larynx, Trachea.—Normal.

The bronchi contained some blood-stained mucus.

Alimentary Canal :

Tongue, Tonsils and Pharynx.—Normal.

Posterior Pharyngeal Glands.—Both were congested ; the left contained two caseous foci 1 mm. in diameter.

Submaxilliary Glands.—The right showed half a dozen caseous foci.

The left contained two minute yellow point.

Oesophagus.—Normal.

Small Intestine.—The small intestines were congested, but showed no tubercle.

Large Intestine.—Normal.

Some glands lying along the posterior border of the pancreas were normal.

The glands on the surface of the rumen were normal.

Two glands in the fat between the third and fourth stomachs showed caseous foci.

A gland about the middle of the mesentery, not enlarged, contained two small caseous foci ; one at the posterior end showed several foci.

Three rectal glands contained caseous foci.

Iliac, Sacro-Iliac and Lumbar Glands.—Normal.

Other Lymphatic Glands :

Right Precrural.—Normal.

Left Precrural.—Showed a small caseous focus.

Right and Left Popliteal, Parotid.—Normal.

Right Supramammary.—Contained two caseous foci.

Left Supramammary.—Normal.

Uterus, Fallopian Tubes, Ovaries, Bladder, Mammary Gland, Thyroid.—Normal.

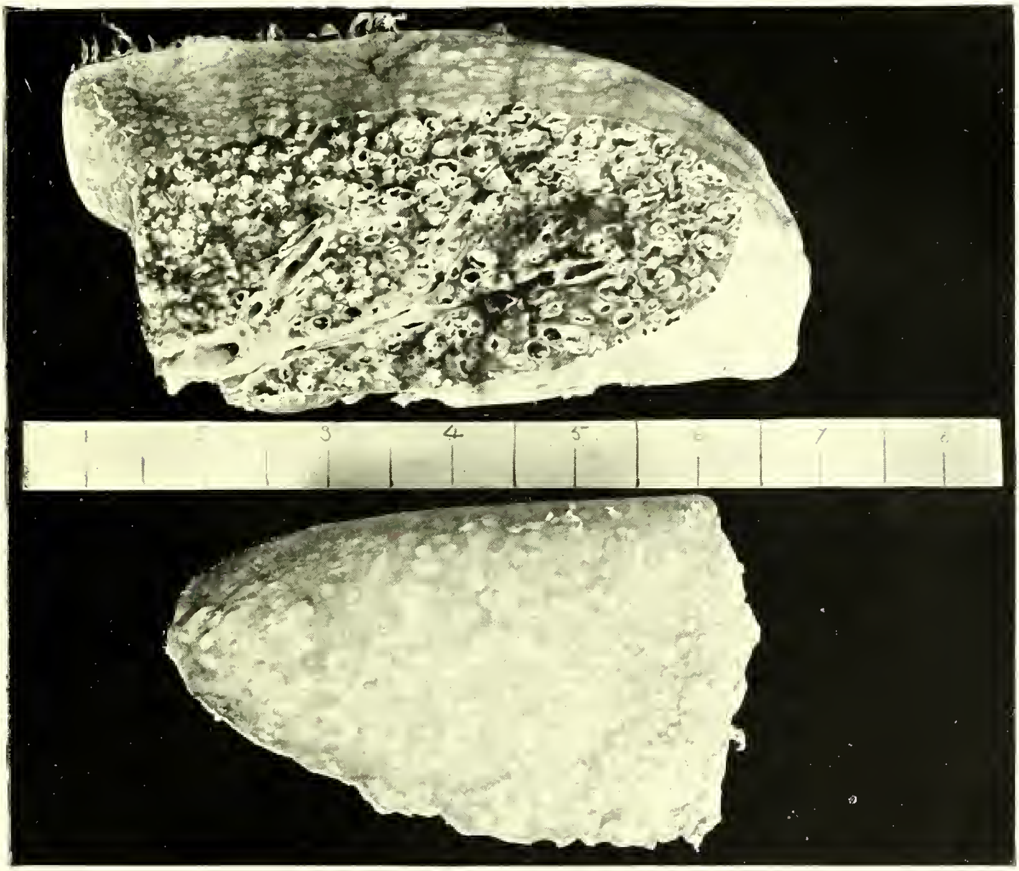
Microscopical Examination.

Smears from :

Left Prescapular Gland (Emulsion	Numerous tubercle bacilli.
Left Prepectoral Gland, *Left Precrural Gland,* *Left Posterior Pharngeal Gland* *Right Supramammary Lymphatic Gland*	Tubercle bacilli.
Mesenteric Gland.—	Numerous tubercle bacilli.
Liver *Spleen*	Tubercle bacilli.
Kidney.—	One tubercle bacillus seen.

Guinea-pigs Inoculated.

Three guinea-pigs inoculated with an emulsion made from the prescapular gland died of general tuberculosis in from 22 to 39 days.



GOAT 2. Subcutaneous. Virus B. V.
Caudal lobe of lung, surface and section.

CALF 224.

Subcutaneous inoculation of culture derived from the original material of Virus B V. through Guinea-pig 711.

Dose—50 milligrammes.

Date—November 25th, 1904.

Weight, 5 days after inoculation—1 cwt. 1 qr. 3 lbs.

Died—January 6, 1905. 42 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on November 25th, 1904.

A week later there was a slightly elevated tender swelling measuring 4 in. by 3½ in., at the posterior border of which a thickened lymphatic vessel could be felt; the prescapular gland measured 3 in. in length.

During the next fortnight the tumour grew very rapidly and on December 16th was prominent, firm, and measured 6½ in by 4½ in. in superficial area; the prescapular gland was greatly enlarged, being 6 in. in length; the muscles between the lower part of the tumour and the prescapular gland were thickened and infiltrated. The prescapular gland then diminished slightly in size, but otherwise the local conditions were unaltered during the remainder of the experiment.

The calf was first noticed to be ill on December 16th, 21 days after inoculation; the respirations were slightly increased and the coat was "staring."

The illness quickly became more acute; the respirations increased in frequency and there was frequent cough: the coat became very rough, the appetite diminished and there was marked emaciation.

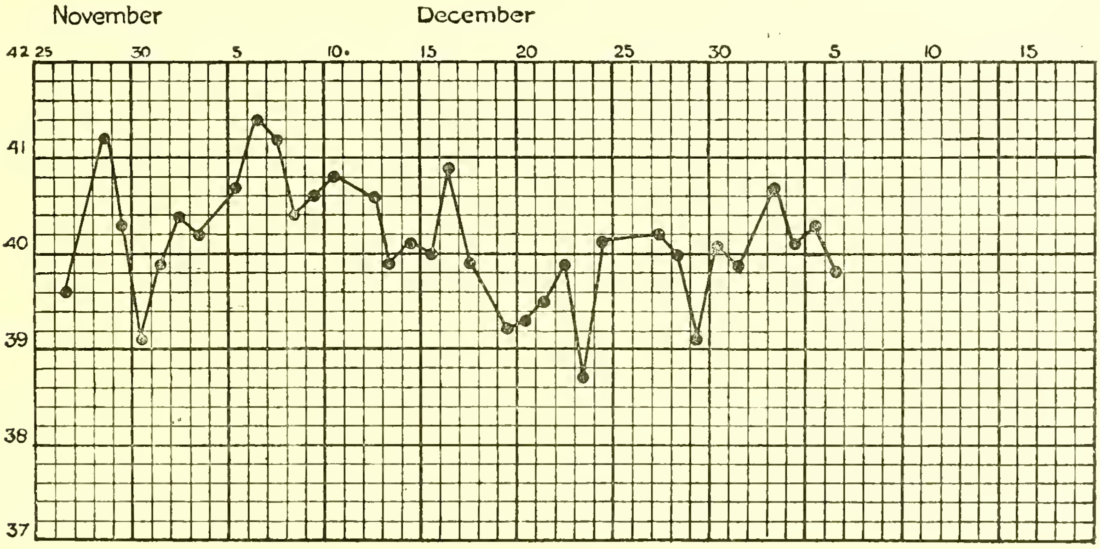
The animal was found dead 42 days after inoculation.

Weights.

During the first fortnight there was a gain in weight of 1 lb.; in the last 24 days the animal lost 1 qr. 4 lbs.

	cwt.	qr.	lbs.
November 30th, 1904 - - - - -	1	1	3
December 13th, „ - - - - -	1	1	4
December 20th, „ - - - - -	1	0	23
December 27th, „ - - - - -	1	0	22
January 6th, 1905 - - - - -	1	0	0
Loss in weight on the initial weight	0	1	3
Average weekly loss - - - -	0	0	5·8

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Poor.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a prominent tumour measuring 6 in. by 5 in. by 2 in., and which weighed 1 lb. 8 ozs. The skin over a large area was infiltrated to the surface, ulcerated and necrotic; at one point near the upper border of the tumour there was a minute opening which communicated with a series of irregular spaces in the body of the tumour, filled with reddish serous fluid; the main mass of the tumour consisted of the usual pinkish yellow juicy necrotic tissue; the muscles beneath were infiltrated with yellow tubercles and nodules for a depth of three-quarters of an inch, and near the tumour were very fibroid.

Several thick cords ran from the local tumour to the prescapular gland in the muscles; on section these were composed of dense yellow caseated tissue.

Left Prescapular Gland.—Measured 4 in. by 2 in. by 2½ in., and weighed 8 ozs.; on section it consisted throughout of dense opaque yellow caseated tissue.

There was a moderate amount of œdema fluid around the local tumour and prescapular gland.

Prepectoral Glands.—The rounded prepectoral gland was about one centimetre in diameter, and was composed of firm translucent tissue, studded with opaque foci.

The kidney-shaped gland lying on the first rib was nearly 2 in. in length; on section at one extremity there was an irregular caseating mass; the rest of the cortex showed discrete tubercles set in a very firm congested tissue.

Cervical Glands.—Near the left mastoid process there were two enlarged glands; one, the size of a walnut, consisted throughout of dense grey tissue, far advanced in caseation; the other, external to the latter, was œdematous, hæmorrhagic, and beset with discrete caseating nodules.

Along the trachea, posterior to the larynx, there was a chain of four glands; two of these, the largest the size of a broad bean, consisted throughout of translucent grey tissue studded with minute yellow foci; the other two were less affected. A gland under the left scalenus was slightly enlarged, hæmorrhagic, and beset with caseating nodules.

The cervical glands on the right side were enlarged, and closely beset with discrete caseating tubercles.

Abdomen :

Omentum.—The omentum showed on the under surface numerous congested firm nodules, yellow in the centre, the largest a little larger than a wheat grain ; there were a few similar nodules on the parietal peritoneum (left side near diaphragm), surface of spleen, of stomach, and on the ligaments of the bladder.

Spleen.—Was much enlarged (weight 1 lb. 5 ozs.), and increased in firmness ; on section it was packed with yellow caseating nodules ranging in size from 1 to 2 mm. in diameter.

Liver.—Was enlarged (weight 5 lbs. 8 ozs.), and slightly paler than normal ; the substance was moderately closely beset with grey tubercles, the greater number of which were the size of mustard seeds ; a few, however, were larger, and ranged up to 2 mm. in diameter ; of the latter those that projected under the capsule were flattened, and in a few instances mushroomed.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged, and consisted throughout of lobulated masses of firm grey translucent tissue, mottled with small yellow patches and foci.

Coeliac Glands.—Were enlarged, and resembled the portal.

Kidneys.—Showed on the surface moderately numerous tubercles (five to fifteen to each large lobule), ranging from 1 to 2 mm. in diameter ; the small tubercles were grey and spherical, whilst the larger ones were opaque in the centre, and extended into the cortex in a wedge-shaped manner. On section similar tubercles were seen in the depth of the cortex ; these often occurred in little groups.

Suprarenal Bodies.—Right suprarenal showed in the cortical zone a minute grey tubercle ; four similar, but slightly larger tubercles were seen in the left suprarenal.

Thorax :

The pleural cavities contained several cubic centimetres of clear yellow fluid.

Pleura.—The fringes along the margins of the ribs were deeply congested and slightly hypertrophied ; they showed a few scattered tuberculous nodules, the largest about 3 mm. in diameter.

On the pleural surface of the diaphragm there were three caseating nodules the size of split peas, and a number of hard tubercles the size of mustard seeds.

Lungs.—Were heavy and weighed 6 lbs. 14 ozs. The substance was packed with opaque tubercles, which ranged in size from a mustard seed to a wheat grain. The cephalic lobes and anterior ventral portions of the caudal lobes were solid, dark red in colour, and sank in water ; on the surfaces of these solid portions the tubercles formed slight projections. In the caudal lobes red consolidated areas alternated with crepitant lung tissue, the latter being small in amount.

In the fringes around the margins of the lungs there were some sparsely scattered tubercles.

Heart.—On the pericardium covering the great vessels there were some patches of congested vegetations, which contained a few shot-sized tubercles. Heart muscle and valves normal.

Mediastinal Glands.—Were moderately enlarged ; the caudal gland measured 3¾ in. by 2 in. by 1 in., and weighed with the dorsal glands anterior to it 4½ ozs.

Bronchial Glands.—The bronchial glands were about three times the normal in size, and weighed together 2½ ozs.

On section the glands showed greyish white, somewhat translucent cortices, mottled with small yellow patches.

Peribronchial glands resembled the mediastinal.

Under the trachea there was a series of small congested glands which contained discrete tubercles.

Larynx, Trachea.—The larynx and trachea were filled with froth ; the mucous membrane of the trachea, throughout its whole length, was bespattered with numerous slightly raised congested ulcerated areas, yellow in the centre, and elongated in the length of the trachea.

Pharynx.—The mucous membrane of the pharynx, at the root of the tongue and above the soft palate, showed a few caseous tubercles.

Tonsils.—Each tonsil contained numerous caseating nodules.

Pharyngeal and Submaxillary Glands.—Were about twice the normal in size, and were packed with caseating nodules.

Small Intestine.—The mucous membrane of the small intestine showed numerous caseous tubercles ; these were situated chiefly in Peyer's patches, and were most numerous at the extremities of the bowel.

Large Intestine.—The solitary follicles appeared to be a little enlarged, but showed no opacities.

Mesenteric Glands.—Were slightly enlarged. On section they showed firm grey tissue in the cortices, beset with minute opaque foci ; the glands at the extremities of the mesentery were more affected than those in the centre.

Ileo-Colic Glands, Colic Glands, Gastric Glands.—Resembled the mesenteric.

Testicles.—Normal.

Various Lymphatic Glands:

Precrural Glands.—Were about twice the normal in size, and closely beset with caseating nodules, the largest the size of a pea.

Iliac Glands, Sacro-Iliac Glands, Pudic Glands, Popliteal Glands, Gluteal Glands.—Were slightly enlarged, and beset with caseating nodules.

Parotid Glands, Ventral Mediastinal Glands, Vertebral Glands, Axillary Glands, Right Prepectoral Gland, Right Prescapular Gland.—Were slightly enlarged, and beset with caseating nodules.

Lumbar Glands, Renal Glands.—Resembled the portal but not so advanced.

Ischiatic Glands.—One ischiatic gland only was found ; this contained caseating tubercles.

Microscopical Examination.

Left Suprarenal Body.—A few tubercle bacilli.
Right Suprarenal Body.—Two tubercle bacilli.
Intestine.—Tubercle bacilli.
Pharynx.—Tubercle bacilli numerous.
Left Tonsil.—Tubercle bacilli moderately numerous.

BULL 88.

Subcutaneous inoculation of culture derived from the original material of Virus B V., through Guinea-pig 711.

Dose—50 milligrammes.

Date—November 25th, 1904.

Weight, 5 days after inoculation—9 cwt. 1 qr. 14 lbs.

Killed—January 9th, 1905. 45 days after inoculation.

Clinical History.

The bull was inoculated subcutaneously on the right side of the neck on November 25th, 1904.

Seven days later there was an elongated slightly raised tumour, measuring 6 in. in length by 2½ in. in breadth. The tumour rapidly increased in size, and when the animal was killed measured 9 in. by 4½ in. by 2½ in.

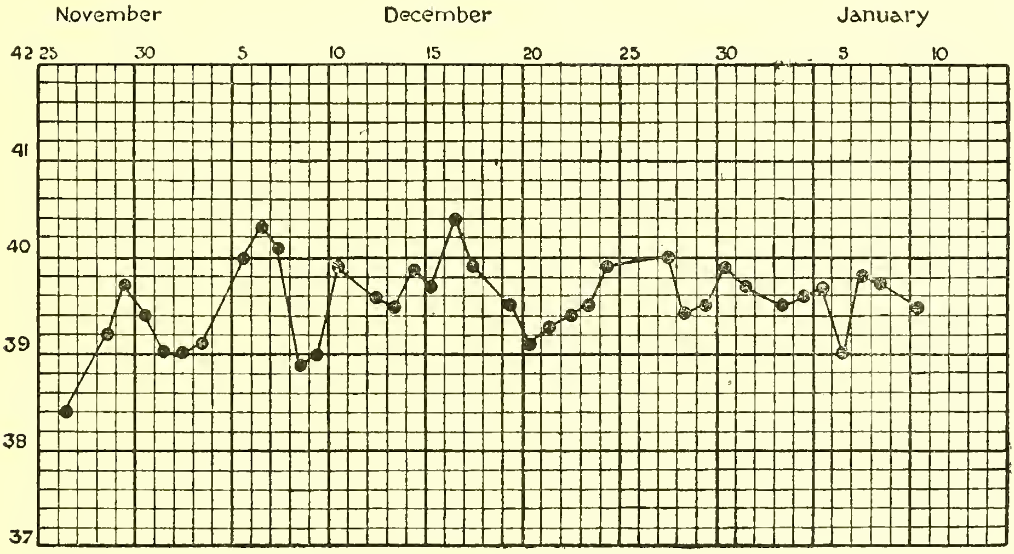
The prescapular gland underwent great enlargement, but the animal was too fat and muscular to admit of accurate measurements being made. No symptoms of ill-health were observed during the experiment.

Weights.

During the first four weeks there was a steady loss in weight, amounting to 1 qr. 21 lbs.; in the last fortnight there was a gain in weight of 9 lbs.

	cwts.	qrs.	lbs.
November 30th, 1904 - - -	9	1	14
December 13th, 1904 - - -	9	1	2
December 20th, 1904 - - -	9	0	20
December 27th, 1904 - - -	8	3	21
January 9th, 1905 - - -	9	0	0
Total loss in weight - -	0	1	14
Average loss per week - -	0	0	6·5

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Very good.

Seat of inoculation.—At the seat of inoculation, on the right side of the neck, there was an elongated tumour, which measured 9 in. by 4½ in. by 2½ in. and weighed, with the skin to which it was attached, 4 lbs. 6 ozs. On section it was composed of rather dark congested juicy necrotic tissue, showing here and there small irregular spaces filled with clear fluid.

The skin was two-thirds of an inch thick, and infiltrated with yellow tubercles, but not ulcerated.

The muscle was firmly adherent, and showed for a depth of half an inch discrete caseating nodules of various sizes.

Right Prescapular Gland.—Weighed 1 lb. 11 ozs., and measured 6 in. by 4 in. by 3 in. On section part of the gland showed firm translucent tissue, studded with opaque tubercles, but the greater part was composed of homogeneous dense pinkish yellow caseated tissue; the capsule of the gland was greatly thickened.

Prepectoral Glands.—The rounded prepectoral gland on the right side, the size of a walnut, consisted of firm grey tissue beset with pearly white tubercles; two deeper prepectoral glands each contained two or three caseating nodules.

On the left side the rounded prepectoral showed four caseating nodules; the rest were normal.

Cervical Glands.—Right upper cervical gland, normal.

Left upper cervical gland contained a single nodule.

The mid cervical glands on both sides, although not much enlarged, contained numerous discrete nodules.

Right lower cervical gland showed numerous discrete nodules.

The gland under the right scalenus anticus was about three times the normal in size, and on section beset with miliary tubercles, which at one extremity had become confluent; the gland on the opposite side was normal.

Abdomen:

Omentum.—On the under surface of the omentum there were about ten firm nodules, ranging in size from a wheat grain to a lentil; these were opaque yellow in the centre, and had greyish red translucent margins.

Peritoneum.—Two small nodules were seen on the left parietal peritoneum, near the margin of the diaphragm.

Spleen.—2 lbs. 12 ozs. Showed no tubercles on the surface; here and there were some rounded elevations (caused by nodules in the substance), over which the capsule gave off connective tissue outgrowths. On section the pulp contained moderately numerous (from five to ten in every square inch of cut surface) nodules, ranging in size from 2 to 5 mm. in diameter; these were opaque yellow in the centre, and had translucent margins.

Liver.—Showed on the surface, just under the capsule, discrete nodules (in an area four inches square twenty nodules were counted), ranging in size from a small shot to a pea; three nodules were raised above the surface and "mushroomed;" the largest of these measured 10 mm. in diameter, and lay in a hollow in the liver substance; the nodules consisted of translucent fibroid tissue, and each showed in the centre a small opaque yellow focus.

On section similar nodules were scattered evenly through the substance.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged, nodular on the surface, and on section closely beset with caseating nodules, which for the most part remained discrete.

Kidneys :

Left.—Showed on the surface two grey nodules two and three millimetres in diameter respectively, with a small amount of central necrosis. In the depth of the cortex two small nodules were seen lying close together.

Right.—Four small nodules seen on the surface and two in the depth.

Suprarenal Bodies.—Right suprarenal showed in the cortex a shot-sized grey tubercle (?) (no tubercle bacilli found).

Left suprarenal normal.

Renal Lymphatic Gland.—Contained numerous discrete grey nodules (up to 4 mm.), with a small amount of central necrosis.

Coeliac Glands.—Were enlarged, and showed rather more numerous nodules.

Thorax :

Heart and Pericardium.—Normal.

The Parietal Pleura.—On the right side, near the sternum, showed a series of grapy nodules lying in the midst of a patch, the size of the palm of one's hand, of reddish vegetations.

The fringes along the margins of the ribs were in places slightly hypertrophied ; two lenticular nodules were seen on each side.

Diaphragm.—On the right side, near the sternum, there was a large patch of soft dirty red vegetations, surrounding about two dozen firm flattened nodules, ranging from 2 to nearly 10 mm. across. The central tendon on the right side was roughened with early vegetations.

The gland in the caval fold of pleura was normal.

Lungs.—Evenly distributed throughout the lung substance were fairly numerous (five to ten to each square inch of surface) congested nodules, ranging in size from a small shot to a small pea. In the anterior lobes and ventral portions of the caudal lobes the nodules projected under the pleura, several in the anterior lobe being surrounded by a fringe of reddish connective tissue. The lung tissue between the nodules was normally crepitant and did not show patches of consolidation. The nodules were opaque and caseous in the centre, translucent and congested around the margins.

The lymphatic fringes mapping out the lobules on the surface of the lung were slightly hypertrophied ; the fringes around the margins of the cephalic lobes were slightly hypertrophied, and contained here and there a lenticular nodule.

The mediastinal pleura was congested and roughened.

Mediastinal Glands.—Caudal mediastinal gland was moderately enlarged (6½ in. by 2½ in. by 1 in.). and on section showed the cortex packed with caseating nodules, which in many places had become confluent.

The glands anterior to this, the bronchial and peribronchial glands, were enlarged, and resembled on section the caudal gland. The tuberculous nodules were not very far advanced in caseation. The medullary parts of the glands were deeply congested.

A gland below the trachea, in front of the heart, was deeply congested, and contained three or four irregular grey nodules in a state of early caseation.

Various Lymphatic Glands :

Left Precrural.—Contained three shot-sized caseating nodules.

Right Precrural.—Contained one tubercle.

Pudic Glands.—Each contained about half a dozen nodules, the largest 4 mm. in diameter.

Iliac Glands.—Were similarly affected.

Popliteal Glands, Right Gluteal Gland.—Each showed one caseating tubercle.

A Pancreatic Gland, Right Axillary Gland, Left Prescapular Gland, Submaxillary Glands, Pharyngeal Glands, Parotid Glands.—Each contained scattered caseating nodules.

Lumbar Glands, Left Gluteal, Left Axillary.—Normal.

Tongue, Tonsils, Pharynx, Larynx, Trachea.—Normal.

Small Intestines.—Two Peyer's patches about the middle of the intestine, and the long Peyer's patch near its anterior end, each contained a small caseating nodule.

Large Intestine, Gastric Glands.—Normal.

Mesenteric Glands.—Not enlarged ; showed altogether seven widely distributed nodules.

Ileo-Colic Glands, Colic Glands, Testicles.—Normal.

Microscopical Examination.

Right Suprarenal Body.—No tubercle bacilli.

Right Precrural Gland.—One tubercle bacillus.

Intestine *Lung Nodule* *Spleen Nodule* *Rounded Prepectoral Gland*	No tubercle bacilli.

CALF 202.

Subcutaneous inoculation of culture derived from the original material of Virus B.V., through Guinea-pig 711.

Dose—0·01 milligramme.

Date—November 25th, 1904.

Weight—2 cwts. 1 qr. 19 lbs.

Killed—February 17th, 1905. 84 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on November 25th, 1904.

Seven days later there was a very slight indefinite thickening at the seat of inoculation; the prescapular gland was unaffected.

The tumour attained its maximum at the end of the third week, measuring about 2 in. by 1 in.; the prescapular gland was twice the normal in size.

Subsequently both the tumour and the gland became smaller.

The calf exhibited no symptoms of ill-health during the experiment.

Temperature.

The temperature rose on the fifth day to 39·2° C. (highest during preceding four days was 38·6°), and throughout the rest of the experiment there was some irregular pyrexia, the temperature fluctuating for the most part between 39° and 39·8°C.

Weights.

During the first fortnight there was a loss in weight of 3 lbs.; subsequently there was a steady gain.

	cwt.	qr.	lbs.
November 30th, 1904 - -	2	1	19
December 13th, 1904 - -	2	1	16
February 17th, 1905 - - -	3	0	4
Gain in weight - - -		2	13
Average weekly increase from December 13th to January 17th - -			6·58

Tuberculin Test.

February 3rd, 1905, 70 days after inoculation Positive. Rise of temperature 0·9°C.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Seat of Inoculation.—In the subcutaneous tissues at the seat of inoculation there was a small tumour measuring 2 in. in length, ¾ in. in breadth, and nearly ½ in. in thickness. On section the central part was yellow, caseous, and highly calcareous, the marginal dense and fibroid; the tumour was adherent to the skin and to the muscle, but did not infiltrate either.

Left Prescapular Gland.—Was only slightly enlarged; it measured 2½ in. by 1¼ in. by a little over ½ in.; on section the cortex contained five caseous masses, ranging in size from a large pea to that of a thrush's egg. They were appreciably gritty from calcification, the calcareous particles lying chiefly in the peripheral parts; each mass was surrounded by a delicate fibrous capsule. Scattered about in the cortex there were also soft caseous tubercles the size of pins' heads.

Left Prepectoral Glands.—Normal.

Cervical Glands.—On both sides normal.

Abdomen :

Omentum, Peritoneum, Spleen, Liver, Portal Glands, Kidneys, Suprarenal Bodies, Intestines, Gastric Glands, Mesenteric Glands, Colic Glands.—Normal.

Thorax :

Pleura, Heart, Pericardium, Lungs, Thoracic Lymphatic Glands.—Normal.

All the peripheral lymphatic glands were examined, and found to be normal.

Testicles.—Normal.

Microscopical Examination.

A smear made from a nodule in the prescapular gland showed no tubercle bacilli.

GOAT 28

Subcutaneous inoculation of culture derived from the original material of Virus B V. through Guinea-pig 711.

Dose—0·01 milligramme.

Date—November 25th, 1904.

Weight—2 qrs. 9 lbs.

Killed—February 24th, 1905. 91 days after inoculation.

Clinical History.

The goat was inoculated subcutaneously on the left side of the neck on November 25th, 1904.

Seven days after inoculation there was a tender subcutaneous thickening, 2 in. by 1 in.; the left prescapular gland was slightly enlarged.

At the end of the third week the tumour measured 4 in. by 2½ in. by about 1 in. in thickness; the skin over it was reddened, adherent, and at one part necrosed and beginning to ulcerate. The prescapular gland was much enlarged and measured 2½ in. in long diameter. On January 12th, 48 days after inoculation, the tumor was smaller, and showed an ulcer 2 in. by ¾ in.; the prescapular gland at this time measured 3 in. in long diameter.

The tumour underwent a little further diminution in size and the ulcer also became much reduced in size.

In the last month a series of thickened nodular lymphatic vessels was felt between the local lesion and the prescapular gland.

There was no disturbance in the general health of the animal throughout the experiment.

Temperature.

The temperature remained normal throughout.

Weights.

The weightof the animal during the experiment varied between 2 qrs. 9 lbs. and 2 qrs. 1 lb.

	qrs.	lbs.
November 30th, 1904 - - - -	2	9
December 13th, 1904 - - - - -	2	4
December 20th, 1904 - - - - -	2	6
January 10th, 1905 - - - - -	2	2
January 31st, 1905 - - - - -	2	5
February 7th, 1905 - - - - -	2	1
February 14th, 1905 - - - - -	2	3
February 24th, 1905 - - - - -	2	6
Loss in weight on the initial weight		3

Tuberculin Test.

February 3rd, 1905. Positive. Maximum temperature 40·8°C. Marked local œdema.

POST-MORTEM EXAMINATION.

Body.—In good condition.

Seat of Inoculation.—In the subcutaneous tissues at the seat of inoculation there was a flattened tumour measuring 3½ in. by 2 in. by ¾ in.; the skin over it was intimately adherent, and showed in the centre an irregular puckered ulcerated area, the floor of which was covered with masses of dried secretion. Around the margins of the ulcer there was a series of rounded elevations, which, when cut into, were seen to be small abscesses with caseo-purulent contents: the skin over these was thinned, and in two or three instances had broken down. The tumour consisted of fibrous tissue, which was studded with softened caseous nodules, ranging in size from that of a shot to that of a small marble; the larger nodules were lined internally with a thin layer of granulation tissue.

The tissues (subcutaneous and muscular) between the local tumour and the prescapular gland were thickened and fibroid, and beset with nodules similar to those in the local tumour; the thickening was greatest midway between the tumour and the gland.

A chain of nodules, which had evidently arisen along a lymphatic vessel, could be traced from the local tumour into the prescapular gland.

Left Prescapular Gland.—Measured 2 in. by 1⅔ in. by 1½ in. and weighed about 2 ozs. On section it was composed throughout of cheesy, irregularly softened, caseated tissue; the more softened portions of the gland had a greenish yellow colour; in the firmer portions close inspection revealed minute opaque foci of calcification.

Left Prepectoral Gland.—Was enlarged, and showed on section two or three minute caseous foci.

Cervical Glands.—The left upper cervical gland, the size of a marble, was caseous throughout, and had a thick fibrous capsule.

A gland in the middle of the neck on the left side, the size of a filbert, contained caseous and softened nodules which replaced more than half the gland substance.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Was slightly enlarged, and showed on the surface about twenty-four prominent rounded yellowish nodules, ranging from 5 to about 12 mm. in diameter; on section they had thick fibrous walls and softened caseous contents. Similar, but on the whole smaller nodules, were scattered throughout the pulp.

Liver.—Showed in the substance, just under the capsule, about twenty nodules ranging from 2 to 5 mm. in diameter; the nodules had translucent fibroid margins and softened caseous centres. On section a few similar nodules were seen in the depth of the liver; many of the larger nodules had a lobular outline, and were evidently formed by the fusion of three or four small nodules.

Portal Glands.—Three in number; contained altogether five caseous and softened nodules, the largest two millimetres in diameter.

Kidneys, Suprarenal Bodies, Large Intestine, Small Intestine, Gastric Glands.—Normal.

Mesenteric Glands.—Two about the middle of the mesentery contained each a caseous nodule the size of a pea.

Ileo-Colic Glands.—An ileo-colic gland showed four or five pea-sized caseous nodules.

Uterus, Ovaries.—Normal.

Thorax:

Heart.—Muscle and valves normal.

Pleura.—Parietal pleura normal. On the pleura surface of the diaphragm there were two long slender processes of connective tissue.

Lungs.—Showed on the surface beneath the pleura moderately numerous slightly projecting nodules ranging in size from a small shot to a large pea; on section they had translucent fibroid margins and soft caseous centres. Similar nodules were seen in the depth of the lung, but these were not so numerous as on the surface.

In the middle of the left caudal lobe there was a caseous softened nodule, the size of a marble, surrounded by a zone of red consolidated tissue. In the centre of the right caudal lobe there was a cavity about ¾ in. in diameter, surrounded by a broad zone of consolidated fibroid lung tissue; the cavity communicated with a neighbouring bronchus, and was lined internally with a thick layer of soft caseo-pus. The fringes around the margin of the caudal lobes were hypertrophied, but did not contain tubercles.

Mediastinal Glands.—The caudal mediastinal gland was about three times the normal in size. On section it showed in the cortex numerous caseous nodules, the largest the size of a kidney bean; many of the nodules had delicate fibrous capsules, and the gland tissue surrounding them felt abnormally firm. A small gland anterior to this was extensively caseated.

Bronchial Glands.—Were enlarged, and on section resembled the caudal gland, the nodules, however, showed more tendency to coalesce.

An infra-tracheal gland was greatly enlarged, and on section resembled the bronchial.

At the seat of inoculation of tuberculin, on the right side of the neck, there was an abscess the size of a pigeon's egg, with fibrous walls, and yellow caseo-purulent contents.

The right mid-cervical gland, the size of a small marble, was extensively caseous and softened.

Right upper cervical gland was normal.

Various Lymphatic Glands.

Right Prescapular Gland.—Was slightly enlarged, and contained two caseous softened nodules, the largest the size of a pea.

Right Prepectoral Gland, Parotid Glands, Submaxillary Glands, Mastoid Glands, Pharyngeal Glands, Axillary Glands, Iliac Glands, Lumbar Glands, Precrural Glands, Popliteal Glands.—Normal.

Tonsils, Pharynx, Larynx, Trachea, Mammary Gland.—Normal.

Microscopical Examination.

Right Prescapular Gland.—No tubercle bacilli.

Ileo-Colic Gland.—One tubercle bacillus.

Pus from Tuberculin Tumour.—No tubercle bacilli.

CALF 352.

Subcutaneous inoculation of culture derived from Heifer 80. (Virus B V.)

Dose—10 milligrammes.

Date—October 24th, 1905.

Weight at inoculation—3 qrs. 2 lbs.

Died—December 3rd, 1905. 40 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 24th, 1905.

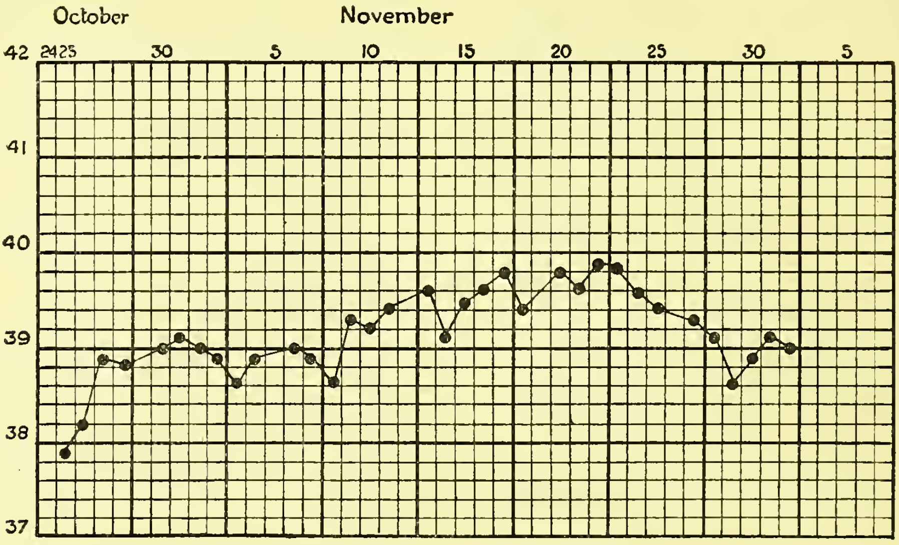
On November 11th, 18 days after inoculation, there was a firm tumour measuring 4½ in. by 3 in. by about 1 in.; the prescapular gland measured 3 in. in long diameter, and the spherical prepectoral gland was the size of a walnut.

Up to this date the health of the animal was good except for occasional cough.

In the fourth week illness rapidly supervened ; the coat became rough ; the appetite poor and the respirations increased ; there were occasional rigors and frequent cough.

These symptoms increased in severity, the calf dying on December 3rd, 1905.

Temperature.



Weights.

During the first month there was a gain in weight of 1 lb., in the last 12 days the calf lost 5 lbs.

	qrs.	lbs.
October 24th, 1905 - - - - -	3	2
November 21st, 1905 - - - - -	3	3
December 3rd, 1905 - - - - -	2	26
Loss in weight - -		4

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On left side of the neck there was a firm tumour which measured 5 in. by 3½ in. by 1½ in., and weighed with the skin and attached muscles 10 ozs. On section the tumour consisted of three layers ; an outer one of thickened, deeply congested skin beset with small yellow tubercles ; a middle one, ¾ in. in greatest thickness, composed of dense yellow caseo-necrotic tissue, and an internal one of fibroid muscular tissue studded with yellow caseous nodules.

Left Prescapular Gland.—The left prescapular gland measured 3 in. by 2 in. by a little over 1 in. On section the greater part of the cortex was thick and composed of dense congested caseo-necrotic tissue which contained a few fine calcareous grains ; that part of the cortex around the hilum was thin and closely beset with congested yellow tubercles becoming confluent.

Right Prescapular Gland.—Contained fairly numerous irregular caseous tubercles ranging in size from 0·5 to 1·5 or even 2 mm. in diameter.

Extending between the local tumour and the spherical prepectoral gland were two caseous lymphatic vessels the thickness of crow quills.

Left Prepectoral Glands.—The spherical gland was enlarged to the size of a walnut, and was dense and caseous throughout. The reniform gland was slightly enlarged, congested, oedematous, and showed a few yellow caseous tubercles.

Axillary Glands.—Contained each a small number of tubercles.

Cervical Glands.—On the left side a mid cervical gland, the size of a small marble, was congested and filled with coalescing caseating tubercles. Other cervical glands on the left side and all those on the right contained discrete caseous tubercles, varying in size from about 1 to 2 mm. in diameter.

A gland just within the entrance to the thorax on the left side was enlarged and deeply congested ; the cortex was closely beset with greyish yellow coalescing miliary tubercles.

Thorax :

Pleura.—On the costal pleura there were several lenticular yellowish nodules, up to 4 mm. in diameter. Along the margins of several of the ribs were lines of dark red villous fringes which contained here and there caseous miliary tubercles, often in small groups.

On the diaphragmatic pleura there were a few lenticular nodules up to 3 mm. in diameter. Along the lines of attachment of the mediastinal and caval pleura there were clusters of small caseous tubercles in hypertrophied lymphatic fringes.

Lungs.—Were heavy, and weighed with the attached glands 5 lbs. 11 ozs. The cephalic and right middle lobes were firm, dark red and quite airless. The left caudal lobe was, with the exception of the extreme posterior portion and a few isolated lobules, in a similar condition ; the right caudal lobe was also extensively consolidated, but contained more crêpitant lung tissue than the left. Both lungs contained moderately numerous, evenly distributed opaque caseating tubercles, mostly about 1 mm. in diameter; a few subpleural tubercles were a little larger. The bronchi in the consolidated areas were filled with whitish muco-pus.

Trachea.—Was filled with froth; the mucous membrane showed scattered ulcerated tubercles with congested margins.

Bronchial Glands and Mediastinal Glands.—Were enlarged, and together weighed 12 ozs.

Mediastinal Glands.—The ventral mediastinal glands contained fairly numerous irregular caseous tubercles, ranging in size from 0·5 to 1·5 or even 2 mm. in diameter.

On section the cortices were closely beset with cascating tubercles, which in the larger glands had coalesced to form areas of grey or greyish red translucent tissue, mottled with caseous foci, each about 1 mm. in diameter.

Heart.—Under the pericardium of the right ventricle there was a pinhead-sized caseous tubercle. Endocardium and muscle normal. Heart cavities filled with firm dark red blood clot.

Abdomen :

Peritoneum.—Parietal peritoneum normal.

Omentum.—On the under surface there was a moderate number of firm nodules with yellow necrotic centres, ranging in size from a millet seed to a wheat grain; some were loosely pedunculated and deeply hæmorrhagic. There was slight hypertrophy of the villous lymphatic fringes.

Small Intestine.—A few pinhead-sized caseous tubercles were seen in the long Peyer's patch.

Large Intestine.—Normal.

Mesenteric Glands and Ileo-Colic Glands.—In the terminal mesenteric and the ileo-colic glands there were numerous caseous foci.

Colic Glands and Gastric Glands.—Contained each a small number of tubercles.

Spleen.—Weighed 10 ozs. The pulp was filled with firm somewhat dark yellow necrotic nodules with congested margins, the largest nearly 3 mm. in diameter.

Liver.—The substance of the liver was closely and evenly beset with opaque greyish yellow tubercles, each about 1 mm. in diameter; on the surface under the capsule there were slightly larger raised tubercles up to 8 mm. in diameter.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged, and showed the cortices beset with irregular opaque whitish tubercles, in places closely aggregated.

Kidneys.—Both kidneys showed on the surface numerous dark points, some bright red, others of a blackish colour; there were also numerous pale wedge-shaped areas in the cortex of each, and a few sparsely scattered miliary tubercles with opaque centres.

Suprarenal Bodies.—Each contained in the cortex a minute opaque tubercle.

Coeliac Glands.—Were enlarged, indurated and cascating.

Lumbar Glands.—Were closely beset with caseous tubercles, becoming confluent.

Iliac Glands and Ilio-Sacral Glands.—Contained fairly numerous irregular caseous tubercles, ranging in size from 0·5 to 1·5 or even 2 mm. in diameter.

Bladder and Testicles.—Normal.

Special Glands :

Precrural and Pudic.—Contained fairly numerous irregular caseous tubercles, ranging in size from 0·5 to 1·5 or even 2 mm. in diameter.

Gluteal and Popliteal.—Contained each a small number of tubercles.

Pharyngeal Glands.—Showed numerous caseous tubercles.

Parotid.—Contained each a small number of tubercles.

Vertebral.—Contained fairly numerous irregular caseous tubercles, ranging in size from 0·5 to 1·5 or even 2 mm. in diameter.

Several hæmo-lymph glands contained caseous tubercles.

Tongue, Tonsils, Pharynx.—Appeared normal.

Larynx.—The mucous membrane covering each arytenoid cartilage showed an ulcerated caseous tubercle 2 mm. in diameter, with congested margins.

CALF 354.

Subcutaneous inoculation of culture derived from Heifer 80. (Virus B V.)

Dose—10 milligrammes.

Date—October 24th, 1905.

Weight at inoculation—3 qrs. 10 lbs.

Killed—January 22nd, 1906. 90 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 24th, 1905.

On November 11th, eighteen days after inoculation, there was a firm tumour measuring 4 in. by 3 in.; the left prescapular gland was 3 in. in length.

The local tumour and prescapular gland increased in size and attained their maxima about the middle of the eighth week; the tumour measured 5 in. by 4 in., and was prominent, firm, and flattened on the surface; the prescapular gland was 4 in. in length.

On January 5th, 73 days after inoculation, thickened lymphatic vessels were felt between the local tumour and the prescapular gland. There was no obvious enlargement of the prepectoral glands.

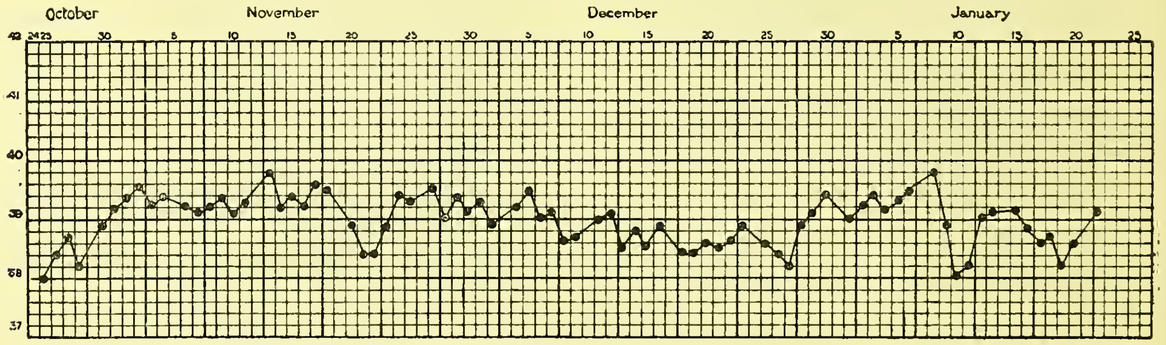
The health of the calf remained moderately good throughout the experiment.

Weights.

There was a steady gain in weight.

	cwt.	qrs.	lbs.
October 24th, 1905 - - -	0	3	10
November 21st, 1905 - -	1	0	0
December 5th, 1905 - - -	1	0	6
December 13th, 1905 - -	1	0	11
January 22nd, 1905 - - -	1	1	14
Gain in weight - - -	0	0	60
Average weekly increase - -	0	0	4·6

Temperature.



POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—At the seat of inoculation there was a firm tumour, which weighed, with infiltrated skin and muscles, 14 ozs., and measured 5½ in. by 3 in. by 1¾ in. On section it was composed of three layers; an external one of greatly thickened skin beset with translucent nodules, with caseous and in some cases gritty centres; a middle one of dense yellowish white caseated tissue, gritty around the margins, and containing in the upper part a small irregular cavity, filled with turbid serous fluid; an internal one of fibroid muscular tissue, closely beset with yellow caseous gritty nodules with translucent margins; the nodules were arranged in rows parallel to the muscle bundles.

Left Prescapular Gland.—Weighed 5 ozs., and measured 3½ in. by 1¾ in. by 1½ in. On section it was composed practically throughout of dense yellowish white caseated tissue, gritty chiefly around the margins; the capsule was thickened.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—On the left side the spherical prepectoral gland was indurated, and beset with irregular caseous slightly gritty tubercles. The reniform gland was enlarged, firmer than normal, and contained numerous irregular yellow foci.

On the right side the spherical gland was normal; the reniform gland contained two caseous gritty nodules, each 4 mm. in diameter.

Axillary Glands.—Normal.

Cervical Glands.—On the left side a gland the size of a broad bean, at the level of the thyroid, showed about half the cortex dense and completely caseated. A gland just within the entrance to the thorax contained some irregular caseo-calcareous nodules, and another in the lower part of the neck showed a caseo-calcareous nodule, the size of a kidney bean. The superior cervical and one or two small glands in the middle of the neck were normal. On the right side the upper cervical contained a caseo-calcareous nodule the size of a pea; other glands on this side were normal.

Thorax:

Pleura.—On the pleural surface of the diaphragm there were about a dozen flattened mushroomed growths, the largest 2 by 1·5 cm. These were pinkish and translucent externally, and on section were yellow, caseous, and slightly gritty in the centre.

On the costal pleura there were half a dozen similar growths.

Lungs.—Showed on the surface, chiefly on the anterior lobes and the ventral parts of the caudal, a number of raised flattened mushroomed growths, resembling those on the pleura; the largest measured 1·5 cm. in greatest diameter. Besides these there were numerous smaller nodules, which caused slight projections under the pleura. On section the latter were evenly distributed throughout the substance. They ranged in size from 2 up to 6 or 7 mm. in diameter, and were yellow, caseous and gritty, with translucent fibrous margins. In the left caudal lobe there was a nodule 1 cm. in diameter. The lung tissue between the nodules was crêpitant, and there were no areas of consolidation.

Trachea.—Normal.

Bronchial Glands and Mediastinal Glands.—Were moderately enlarged, and weighed together 8 ozs. On section the cortices were caseo-calcareous practically throughout. In the mediastinal glands the caseo-calcareous tissue formed a coarse network, the interstices of which were filled with translucent tissue. In the bronchial glands there were besides the network some large caseous patches.

Heart.—Normal.

Abdomen:

Peritoneum.—Parietal peritoneum normal.

Omentum.—On the inferior surface there were two loosely attached firm nodules, rather larger than barley grains, with slightly opaque centres. The surface of the omentum in contact with the stomach showed a larger pedunculated lenticular nodule, yellow and gritty in the centre.

Intestines.—Normal.

Gastric Glands.—Normal.

Mesenteric Glands.—Contained scattered caseo-calcareous nodules, the largest about 1 cm. in diameter.

Ileo-Colic Glands.—Contained each several irregular caseous gritty nodules, varying in size up to 6 mm.

Pancreatic Glands.—Two or three glands around the pancreas contained similar nodules.

Spleen.—Weighed 9 ozs. The pulp contained a moderate number of yellow caseous slightly gritty nodules, ranging in size from 2·5 to 5 mm. in diameter. Each was surrounded by a translucent fibrous capsule.

Liver.—Normal in general appearance. Showed on the surface a moderate number of greyish white nodules, ranging in size from 2 up to 8 mm. in diameter; the larger ones were raised, flattened, and mushroomed. The rest were embedded in the substance, and were either only slightly raised above the surface, or were dimly seen in the depth. Besides the nodules, fairly numerous yellowish foci, the largest about 1 mm., were seen under the capsule. On section spherical nodules, up to 2 mm. in diameter, were sparsely distributed throughout the substance. The nodules were caseous and gritty, and had fibrous margins.

Gall Bladder.—Normal.

Portal Glands.—Were slightly enlarged, and contained fairly numerous discrete caseous gritty nodules, the largest 3 mm. in diameter.

Kidneys.—The left kidney showed in the cortex two caseous gritty nodules, with grey translucent margins, one the size of a pea, the other much smaller. The right kidney showed in the cortex two slightly gritty caseous nodules, each about the size of a wheat grain.

Suprarenals.—Suprarenal bodies normal.

Renal Glands.—The renal gland was beset with caseous gritty nodules, up to 5 mm. in diameter.

Cœliac Glands.—One cœliac gland, the size of a pigeon's egg, was very dense and irregularly caseated; in the caseated tissue were numerous gritty particles.

Left Iliac Gland.—Contained a caseous gritty nodule, with a fibrous margin, 3 mm. in diameter.

Right Iliac Gland, Ilio-Sacral Glands.—Normal.

Genito-Urinary System:

Testicles.—Normal.

Special Glands:

Precrural.—The left precrural contained two caseous gritty nodules, each 5 mm. in diameter. In the right gland there was a similar slightly smaller nodule.

Pudic, Gluteal, Popliteal.—Normal.

Submaxillary, Parotid, Pharyngeal.—Contained similar nodules to those in the precrural glands, one to three in each.

Hæmolymph glands normal.

Tongue, Tonsils, Pharynx, Larynx, —Normal.

Eyes.—Normal.

CALF 246.

Subcutaneous inoculation of culture derived from Heifer 80. (Virus B V.)

Dose —50 milligrammes.

Date—March 14th, 1905.

Weight, 7 days after inoculation—3 qrs. 15 lbs.

Killed—In a dying condition, April 30th, 1905. 47 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on March 14th, 1905.

Three days later there was a flat subcutaneous thickening 3 in. by 1½ in.; the prescapular gland on the same side was slightly enlarged.

Eight days after inoculation the tumour measured 5 in. by 2½ in. in superficial area and about 1 in. in thickness.

The tumour grew rapidly and attained its maximum, 7 in. by 4 in. by 2 in. about a month after inoculation; it was firm and extended from the middle of the neck into the loose tissues under the trachea.

At this time the prescapular gland measured 5 in. in long diameter, and an enlarged prepectoral gland could be felt.

Just under the skin at the upper extremity of the prescapular gland there was an enlarged and indurated gland.

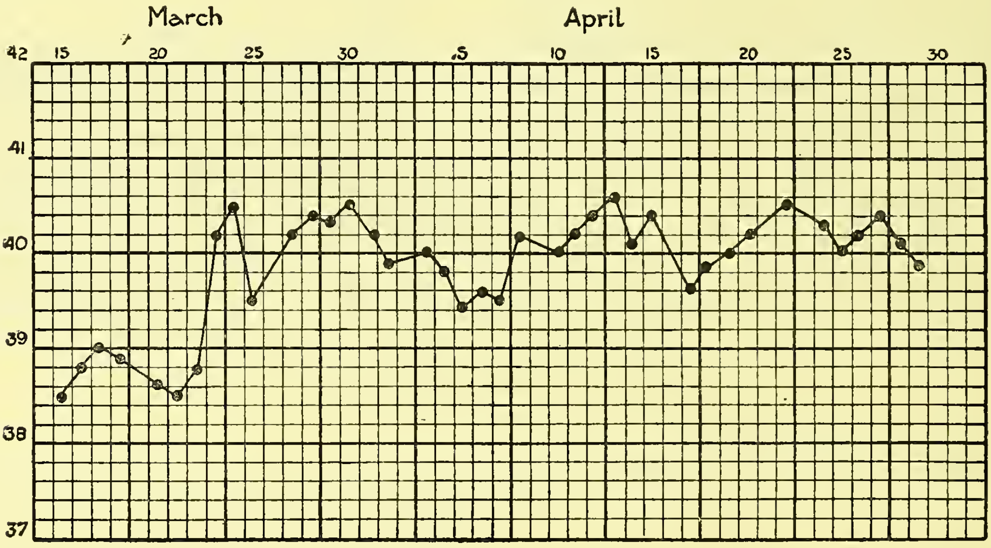
At the end of a month no signs of ill-health had been observed beyond some slight roughening of the coat.

In the fifth week illness gradually supervened, the respirations began to increase; the appetite became poor and the animal began to lose weight.

The respirations continued to increase, and in the last week were rapid, laboured and jerky.

The animal gradually became thinner and weaker, and on the morning on which it was killed was unable to rise from the ground.

Temperature.



Weights.

There was a steady gain in weight during the first five weeks; in the last eleven days of life the calf lost 20 lbs. in weight.

	qrs.	lbs.
March 21st, 1905 - - - - -	3	15
April 19th, 1905 - - - - -	3	23
April 25th, 1905 - - - - -	3	14
April 30th, 1905 - - - - -	3	3
Loss in weight on the initial weight - -		12

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck, extending into the dewlap there was an elongated tumour, which measured 7 in. vertically, 4 in. in breadth, and 2 in. in greatest thickness. On section that part of the tumour situated in the subcutaneous tissues (1 in. in greatest thickness) was composed of dense yellow caseo-necrotic tissue, showing in the upper part small spaces filled with clear serous fluid; the skin was thoroughly adherent, and infiltrated with congested caseous tubercles; the superficial muscles under the upper part of the tumour were dense and fibroid, and beset with large caseous nodules for a depth of about an inch.

Left Prescapular Gland.—Weighed 7 ozs., and measured 4 in. by 2½ in. by 2½ in. On section it was composed throughout of very firm pinkish yellow caseo-necrotic tissue; the capsule was much thickened.

In the subcutaneous tissues opposite the upper extremity of the gland there was an indurated gland the size of a thrush's egg, which on section was yellow and caseous throughout; there was a similar gland in contact with the inferior extremity of the prescapular gland.

Prepectoral Glands.—The spherical prepectoral gland measured 2 cm. in diameter, and on section resembled the prescapular. The kidney-shaped gland, 3 cm. in length, showed half its cortex composed of firm reddish grey tissue, containing minute scattered whitish foci of caseation.

Cervical Glands.—One of the lower cervical glands on the left side was enlarged, indurated, and in a state of early caseation. Other cervical glands on the left side, and all those on the right, contained caseating nodules.

Abdomen :

Omentum.—On the inferior surface there was a small number of lenticular nodules, the largest the size of a wheat grain; a few of the nodules were hæmorrhagic. In the centres of the polygonal areas there were little groups of grey granules, situated in slightly hypertrophied lymphatic fringes.

On the peritoneal surface of the diaphragm there was a small dark red loosely attached pedunculated nodule.

Spleen.—Weighed 6 ozs. It was normal on the surface. On section the pulp showed fairly numerous caseating tubercles, mostly about 1·5 mm. in diameter (tubercles not so numerous as in the more acute cases).

Liver.—Normal in size, colour and texture. Showed on the surface a moderate number of caseating nodules, ranging from 1·5 to 5 mm. in diameter; the nodules were most numerous on the surface of the left lobe, and some of these were considerably flattened out and "mushroomed." On section tubercles, ranging in size from a pin's head to a small wheat grain, were sparsely scattered throughout the substance.

Gall Bladder.—The mucous membrane showed some small congested erosions covered with little masses of mucus; under the membrane there was one minute tubercle (?).

Portal Glands.—Were very large, and showed on section nodular masses of caseating tubercle.

Kidneys.—Each kidney showed a moderate number of grey tubercles, caseous in the centre, the largest the size of a millet seed; there was besides a number of grey points just visible to the naked eye.

Suprarenal Bodies.—The left suprarenal body showed in the cortex three minute caseous tubercles; in the right suprarenal there were about half a dozen.

Thorax:

Heart.—Muscle, pericardium and endocardium normal.

Pleura.—Along the margins of the ribs there were discontinuous rows of slightly developed tuberculous granulations; similar granulations were seen on the pleural surface of the diaphragm. On the ventral mediastinal fold of pleura, and on the pleura covering the pericardium, there was a slight development of velvety vegetations, in some of which minute grey granules could be seen; there were also two or three caseating tubercles the size of millet seeds.

Lungs.—The anterior lobes and the extreme anteroventral portions of the posterior lobes were practically completely consolidated; they showed a few small emphysematous patches, seen chiefly on the dorsal borders. The posterior parts of the caudal lobes showed no large areas of consolidation, but around single nodules, or small groups of nodules, were irregular dark red patches of collapse. The lung tissue was moderately closely beset with grey caseating nodules, ranging in size from a pin's head to a wheat grain. The nodules appeared to be more numerous in the cephalic lobes than in the caudal; they caused slight projections under the pleura (except in the caudal lobes), and some of these surface nodules, owing to their being flattened out by pressure on the ribs, appeared to be larger than those in the depth.

Thoracic Glands.—The caudal mediastinal gland was enlarged, measuring $5\frac{1}{2}$ in. by 2 in. by $\frac{3}{4}$ in. On section the cortex showed firm grey tissue, permeated with an opaque yellow caseous network. The glands anterior to the above were enlarged, and on section resembled the caudal gland; the dorsal mediastinal glands together weighed 5 ozs.

The bronchial, peribronchial and infratracheal glands were much enlarged, and on section resembled the mediastinal.

The glands in the caval fold of pleura were enlarged and tuberculous.

Tonsils.—Each tonsil contained a few caseating nodules, the largest 2 mm. in diameter.

Pharynx, Larynx, Trachea.—Normal.

Intestines.—The long Peyer's patch showed fairly numerous caseous tubercles under the mucous membrane. Similar tubercles were seen in the patches in the anterior half of the intestine; some were also seen under the mucous membrane; they were not very numerous in the middle region of the intestine.

Some of the solitary follicles in the large intestine were congested on the surface, but not obviously caseous.

Mesenteric Glands.—The glands in the middle of the mesentery showed discrete caseating nodules, as in the peripheral glands; in those towards each extremity the nodules were more numerous, and had in many places coalesced.

Gastric Glands, Colic Glands.—Contained caseating nodules, some being more affected than others.

Urinary Bladder, Eyes, Thyroid Body, Testicles.—Normal.

Various Lymphatic Glands:

Cœliac, Renal, Lumbar.—Were enlarged, indurated, and resembled on section the portal (one or two small cœliac glands were not so severely affected as the larger ones).

Precrural.—Contained numerous caseating nodules, the largest about 3 mm. in diameter.

Pudic, Popliteal, Gluteal, Ischiatic, Iliac, Ilio-Sacral, Ventral Mediastinal, Right Prescapular, Right Prepectoral, Parotid.—Resembled the precrural.

Submaxillary, Retropharyngeal.—Were closely beset with caseating nodules.

Axillary.—Were very small; each contained a caseating nodule.

Vertebral.—Contained a few nodules.

Several hæmolymph glands contained caseous nodules.

Microscopical Examination.

Tonsil *Small Intestine*	Numerous tubercle bacilli.
Gall Bladder *Suprarenal Body*	No tubercle bacilli.

VIRUS B VI.

May 24, 1904.

MEDIASTINAL GLAND.

The specimen sent was an enlarged mediastinal gland from a cow. The gland consisted throughout of dense yellow caseated tissue, gritty on section.

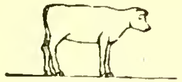
VIRUS B VI.

(May 24th, 1904).

MEDIASTINAL GLAND.

Culture Inoculations.

Inoculated on October 24, 1904, with culture derived from the original material. The culture used was the 18th generation, 21 days old ; the total age of the culture was 154 days.



CALF 216.

Subcutaneous.

Dose : 25 mg.

Killed, when ill, December 7, 1904.
(42 days.)

P.M.—General tuberculosis.

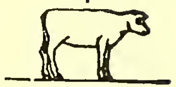
RABBITS.

No. of Rabbit.	Dose.	Method of inoculation.	Duration of life.	Result.
131	1·0 mg.	Intrap.	D. 15 days	G.T.
130	1·0 mg.	Subcut.	D. 95 days	G.T.
132	1·0 mg.	Subcut.	D. 85 days	G.T.

Inoculated on February 16, 1905, with culture derived from the original material through Guinea-pig 1,015. The subculture used was the 6th generation, 20 days old ; the total age of the culture was 248 days.

RABBITS.

No. of Rabbit.	Dose.	Method of inoculation.	Duration of life.	Result.
179	1·0 mg.	Intrav.	D. 20 days	G.T.
181	1·0 mg.	Intrap.	D. 19 days	G.T.
180	1·0 mg.	Intrap.	D. 61 days	G.T.
182	1·0 mg.	Subcut.	D. 65 days	G.T.
183	1·0 mg.	Subcut.	D. 83 days	G.T.



CALF 240.

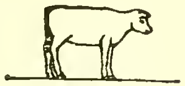
Subcutaneous.

Dose : 50 mg.

Killed, in good health, April 11, 1905.
(54 days.)

P.M.—Softened local lesion ; neighbouring glands tuberculous ; the lungs contained a considerable number of small tubercles ; there were about thirty tubercles in the spleen, none in the liver or kidneys ; the thoracic and some of the abdominal lymphatic glands were tuberculous.

Inoculated on September 2nd, 1905, with culture derived from the original material through Guinea-pig 1,015.
The culture used was the 14th generation, 20 days old ; the total age of the culture was 446 days.



CALF 330.

Subcutaneous.

Dose : 50 mg.

Died, October, 4th, 1905 (32 days).

P.M.—General tuberculosis.

RABBITS.

No. of Rabbit.	Dose.	Method of inoculation.	Duration of life.	Result.
413	1·0 mg.	Intrap.	D 15 days	G.T.
415	1·0 mg.	Intrap.	D 21 days	G.T.
414	0·1 mg.	Intrap.	D 36 days	G.T.
416	0·1 mg.	Intrap.	D 29 days	G.T.

COW 300.

Subcutaneous.

Dose : 100 mg.

Died, October 2nd, 1905 (30 days)

P.M.—General tuberculosis.

CALF 216.

Subcutaneous—Inoculation of culture derived from the original material of Virus B. VI.

Date—October 24th, 1904.

Dose—25 milligrammes.

Weight—1 cwt. 1 qr. 16 lbs. **Age**—16 weeks.

Killed—December 7th, 1904. 42 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on October 24th, 1904.

On the day after inoculation a small thickening was felt at the site of inoculation. This increased rapidly in size, and seven days later there was a hot, tender swelling measuring 4 in. by 3 in. by (about) ¾ in.; the prescapular gland was distinctly enlarged.

On November 11th, 1904, 18 days after inoculation, the tumour had become very large and measured 8½ in. from above downwards, 4½ in. from side to side, and between 2 in. and 3 in. in thickness; the left prescapular gland was nearly 6 in. in long diameter, and a prepectoral gland was the size of a walnut.

The tumour increased still further in size, and on December 2nd, 1904, was very prominent and thick, and measured 10 in. in length and 5½ in. in breadth; the thickest part was elastic and gave a deep sense of fluctuation; the skin over the tumour was covered with dried secretion; there was slight œdema of the dewlap.

The calf began to took ill towards the end of the third week, but no marked symptoms of ill-health were observed until November 21st, 28 days after inoculation; on this date the respirations were slightly increased in frequency, the coat was staring and the animal seemed to be losing flesh. The respirations gradually became more frequent and were finally laboured. When killed the calf was ill, but was not *in extremis*, and would probably have lived a few days longer.

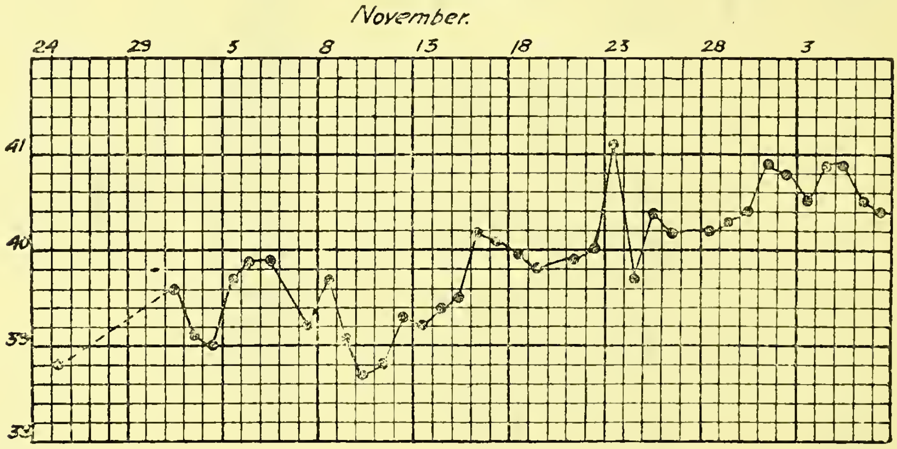
Weight.

During the first three weeks the calf gained 16 lbs. in weight; it then began to lose, and from November 15th to December 7th there was a loss in weight of 17 lbs.

	cwt.	qr.	lbs.
October 25th, 1904 - - -	1	1	16
November 15th, 1904 - - -	1	2	4
November 23rd, 1904 - - -	1	2	3
November 30th, 1904 - - -	1	1	21
December 7th, 1904 - - -	1	1	15

There was a difference of 1 lb. between the initial and the final weight.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a very large tumour, which measured ten inches vertically, five inches antero-posteriorly, and about three inches in thickness. The upper and broader part was fluctuant, and showed on the skin surface cracked dried secretion, under which the skin was eroded; the lower part was firm, thinner than the upper part, and tapering. When removed the tumour, with skin and infiltrated muscles, weighed 2 lbs., 12 ozs.

On section the upper part of the tumour contained a lenticular cavity 5 in. by 3 in. by about 1½ in., filled with clear reddish watery fluid; the internal walls were irregular, with shaggy masses of caseo-necrotic tissue; the cavity was surrounded by a thick layer of firm pinkish-yellow necrotic tissue, which was adherent to the skin on the one hand and the muscles on the other. The muscles showed a great increase of white fibrous connective tissue, and were infiltrated for a depth of an inch with yellow nodules and tubercles. The skin was deeply congested, and studded with yellow tubercles throughout its whole thickness. The central part of the lower portion of the tumour consisted of firm tissue similar to that around the cavity; the marginal part of pinkish translucent tissue penetrated by yellow streaks continuous with central part; the muscle and skin were adherent, but showed only here and there isolated tubercles.

Uniting the local tumour to the superior extremity of the prescapular gland were two thick cords, one, half an inch, the other three-quarters of an inch in diameter, On section these showed a central core of dense opaque yellow tissue, which was just perceptibly gritty, surrounded by a zone of translucent fibroid tissue, in which were some isolated yellow foci.

Left Prescapular Gland.—Weighed 11 ozs., and measured 4½ in. by 3 in. by 2 in. On section the cortex consisted throughout of dense pinkish-yellow caseo-necrotic tissue, which showed here and there minute opaque yellow gritty foci. The capsule of the gland was greatly thickened, and in the upper external part was infiltrated with small yellow tubercles, and closely adherent to the superficial muscle.

Prepectoral Glands.—One prepectoral gland was enlarged to the size of a walnut, and was stony hard; on section it resembled the prescapular gland.

A deeper prepectoral, the size of a filbert, was firmer than normal in the cortex, but showed no obvious opaque foci; a gland posterior to the latter, lying on the first rib, resembled the latter at one extremity.

A greatly enlarged gland just within the entrance to the thorax on the left side showed throughout the cortex firm grey translucent tissue studded with yellow foci.

The corresponding gland on the opposite side was normal.

Cervical Glands.—The left upper cervical gland measured 2¾ in. by 1½ in., and on section consisted throughout of firm tissue permeated with a yellow network.

Near this there was a slightly smaller gland, similarly affected (both these glands lay near the mastoid process).

A small gland close to the above showed caseous foci.

A cervical gland at the junction of the middle and lower thirds of the neck resembled the upper cervical.

An œdematous gland anterior to this showed no foci.

The right upper cervical gland, the size of a broad bean, was indurated at one extremity, and in a state of early caseation. Other cervical glands on the right side were normal.

Abdomen:

Omentum.—Showed on the under surface about a dozen hard nodules ranging in size from a wheat grain to a large pea; on section they were yellow in the centre, translucent around the margins.

Spleen.—Weighed 12 ozs. On the surface there were three or four small flattened tubercles; in the pulp there were numerous spherical nodules, ranging in size from a small shot to a large pea (majority of the latter size). On section they had irregular yellow necrotic centres and translucent margins.

Liver.—Weighed 5lbs. 4 ozs. On the surface there were moderately numerous pearly grey tubercles with yellow centres, ranging in size from a pin's head to a barley grain; some of these formed rounded projections on the surface; others were flattened and had overhanging margins. Similar tubercles were scattered throughout the liver substance.

Gall Bladder.—Normal.

Portal Glands.—Greatly enlarged; cortices were packed with caseating nodules and nodular masses.

Kidneys.—On the surface of the left kidney, projecting slightly, were about a dozen tubercles ranging in size from a pin's head to a wheat grain; the small tubercles were spherical, the larger ones wedge-shaped, all had opaque yellow centres and grey translucent margins; in the deeper parts of the cortex similar tubercles were seen; the medullary zones were free.

The right kidney contained similar, but rather more numerous tubercles.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Muscle and valves normal.

Endocardium, Pericardium.—Normal.

There was a slight excess of fluid in the pleural cavity.

Pleura.—Near the vertebral column on each side there was a firm pinkish mushroomed nodule, yellow in the centre, about 5 millimetres in diameter.

The fringes along the margins of the ribs were not hypertrophied.

On the pleural surface of the pericardium there was a pea-sized nodule resembling those on the omentum.

On the pleural surface of the diaphragm there was no development of vegetations, but near the reflection of the mediastinal pleura there was a cluster of small tubercles.

Lungs.—Weighed 9lbs. The ventral portions of the cephalic lobes and the antero-ventral parts of the caudal lobes were firm, reddish and consolidated; their surfaces were studded with projecting grey nodules, ranging in size from a pin's head to a large pea. On section the lung tissue was seen to be packed with these nodules, which here and there showed a tendency to coalesce; the nodules were somewhat irregular in outline, were yellow and necrotic in the centre, and had grey translucent margins. The dorsal parts of the lobes were for the most part air containing, but showed here and there consolidated lobules; the crepitant portions of the lung contained nodules similar to those in the solid parts, but not so numerous.

Around the margins of the cephalic lobes there were a few small tubercles.

Thoracic Glands.—The caudal mediastinal gland measured 5 in. by 2 in. by 1 in., and weighed about 3½ ozs. On section the cortex showed firm grey translucent tissue, surrounding small irregular yellow necrosed patches and whitish foci.

Two enlarged glands anterior to this, together weighed 2 ozs., were similarly affected.

In the anterior part of the dorsal mediastinum there was a large œdematous gland, which showed no macroscopic tubercles.

The saddle-shaped left bronchial gland weighed 3 ozs., the right bronchial about 1 oz.; both on section resembled the mediastinal glands, but were perhaps a little more advanced in caseous necrosis.

On each side, near the bronchial glands, there was a small œdematous gland which showed one or two grey foci.

Below the trachea, and grooved by it, there was a large gland (one and a half ounces), resembling on section the bronchial glands.

The peribronchial glands resembled the bronchial.

Tonsils.—The right tonsil showed a small caseous tubercle. The left was normal.

Tongue, Pharynx.—Normal.

Intestines.—In the upper part of the small intestine there were numerous caseous nodules, 2 to 3 millimetres in diameter, the mucous membrane over each of which showed a small central congested ulcer; they occurred in Peyer's patches as well as under the mucous membrane. In the lower part there were similar, sparsely scattered nodules.

Large intestine: In the cæcum several of the solitary follicles were enlarged and caseous.

Gastric Glands.—Several contained caseous nodules in the cortex.

Mesenteric Glands.—In the posterior part of the mesentery some were normal; others contained one and two caseous nodules; in the anterior part the glands were more affected, and one or two were practically tuberculous throughout; others were closely studded with nodules up to 1 centimetre.

Ileo-Colic Glands.—Contained caseous nodules.

Various Lymphatic Glands.

Parotid Glands.—Each parotid gland showed a caseous nodule the size of a pea.

Pharyngeal Glands.—Contained several congested caseating nodules.

Submaxillary Glands.—Left submaxillary gland contained several groups of nodules. Right submaxillary gland showed a mass of nodules affecting a third of the substance.

Right Prescapular Gland.—Was studded with congested caseating nodules, ranging in size from a pin's head to a small pea.

Right Prepectoral Glands.—One contained a caseous tubercle.

Axillary Glands, Popliteal Glands, Gluteal Glands.—Normal.

Precrural Glands.—Right precrural contained one, and left precrural five or six caseous tubercles.

Pudic Glands.—Left pudic gland contained a caseating nodule 2 millimetres in diameter.

Lumbar and Coeliac Glands.—Enlarged, with numerous caseating nodules in the cortices.

Sacro-Iliac Glands, Iliac Glands.—Two sacro-iliac and the iliac glands each contained a caseous tubercle.

Several haemo-lymph glands near the local tumour showed tubercles.

Testicles.—Normal.

Microscopical Examination.

Prescapular Gland (Emulsion).—Moderately numerous tubercle bacilli.

Intestine (two foci).—A few tubercle bacilli in both.

Second Prepectoral Gland.—No tubercle bacilli seen.

Right Tonsil.—Numerous tubercle bacilli.

Guinea-pig Inoculated.

A guinea-pig was intraperitoneally with an emulsion made from the prescapular gland and died of tuberculosis in 18 days.

CALF 240.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VI., through Guinea-pig 1,015

Date—February 16th, 1905.

Dose—50 milligrammes.

Age—11 weeks.

Weight—February 21st, 1905, 1 cwt.

Killed—April 11th, 1905. 54 days after inoculation.

Clinical History.

The calf was inoculated on the left side of the neck on February 16th, 1905.

Five days later there was a flat thickening 4 in. by 1½ in.; the prescapular and prepectoral glands were slightly enlarged.

On March 2nd, 1905, 14 days after inoculation, the tumour had diminished in area, but was more prominent and localised and was about the size of a hen's egg. The left prescapular gland measured 3 in. in length and a prepectoral gland was the size of a marble. The tumour softened and became more spherical, otherwise there was no change in the local conditions during the rest of the experiment.

There were no constitutional symptoms during the experiment and the animal appeared to be in perfectly good health when killed.

Weights.

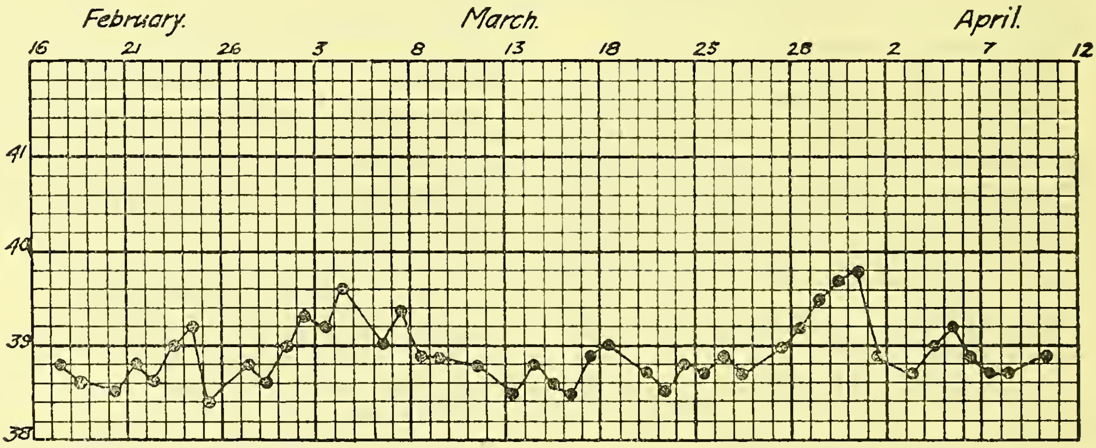
There was a steady increase in weight.

	cwt.	qr.	lbs.
February 21st, 1905 - - - - -	1	0	0
April 11th, 1905 - - - - -	1	1	20

Gain in weight, 48 lbs.

Rate of gain per week, 6·2 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was an abscess the size of a hen's egg, with caseo-purulent contents and thin fibrous walls, pale and smooth on the internal surafce. There were three or four small isolated nodules at the margins of the tumour.

Left Prescapular Gland.—Measured 2¾ in. by 1½ in. by ⅔ in. On section, there was at one extremity a caseous nodule the size of a thrush's egg; this was gritty around the margins, and at one point broken down to form thick caseo-pus; about the centre of the gland there was an irregular caseous nodule a little larger than a pea. In the rest of the gland, situated chiefly in the cortex, were numerous discrete yellow foci, embedded in normal-looking gland tissue; most of these were softened, and some were slightly gritty.

Right Prescapular Gland.—1¾ in. by ¾ in. by ½ in. Was normal on section.

Prepectoral Glands.—The rounded prepectoral gland on the left side was nearly half an inch in diameter, and consisted throughout of pinkish yellow caseated tissue, showing signs of softening around the periphery; other prepectoral glands on this side as well as those on the right were normal.

Cervical Glands.—On the left side the superior cervical gland was normal. Three mid cervical glands contained small caseous tubercles. A gland at the junction of the middle and lower thirds of the trachea, the size of a broad bean, contained a pea-sized caseous partly softened nodule, and discrete caseous foci in the rest of the cortex. Two small glands between the latter and the first rib showed a few yellow foci.

The glands on the right side were normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Spleen.—Normal on the surface. Showed scattered throughout the pulp a number (thirty counted) of spherical tubercles, varying in size from 1 to 1·5 millimetre in diameter; each tubercle showed a minute caseous gritty focus in the centre.

Liver.—Appeared normal on the surface and on section.

Portal Glands.—Not enlarged. One contained about half a dozen pinhead-sized tubercles, opaque and gritty in the centre; another contained two similar tubercles.

Cœliac Glands.—One of the cœliac glands showed a small caseous focus; the rest were normal.

Kidneys, Suprarenal Bodies.—Normal.

Thorax:—

Heart, Pericardium, Pleura.—Normal.

Lungs.—The lungs were normal in general appearance; they contained a considerable number of little dark grey congested tubercles, ranging in size from a pin's head to a millet seed. Most of these were translucent throughout, or had slightly opalescent centres, whilst a few were caseous, and just perceptibly gritty in the centre.

In the midst of the left caudal lobe there was a nodule 1 centimetre in diameter, composed of reddish translucent tissue, beset with softened caseous foci, and which contained also a pea-sized softened caseous mass, in which gritty particles could be detected.

Mediastinal Glands.—The caudal mediastinal gland showed towards one extremity a localised enlargement; in the centre of this there was an irregular firm caseous mass about 8 millimetres in diameter, gritty around the margins; the gland tissue for a good distance around the mass was closely studded with pinhead-sized calcareous tubercles. In the rest of the gland there were sparsely scattered yellow tubercles.

Two glands anterior to this showed discrete gritty tubercles, mostly about the size of millet seeds.

Bronchial Glands.—The left bronchial gland was enlarged to about twice the normal. On section, there was in the centre a firm caseous mass, gritty around the margins, the rest of the substance being closely studded with pinhead-sized tubercles, opaque and slightly gritty in the centre.

The right bronchial gland was not obviously enlarged; it contained a few opaque gritty tubercles.

The infra-tracheal gland was similarly affected.

The peribronchial glands on each side contained each one or two tubercles; a small gland in the mediastinal pleura, near the diaphragm, showed one tubercle.

Ventral mediastinal glands were normal.

Larynx, Trachea, Tongue, Tonsils, Pharynx, Large Intestine, Small Intestine, Testicles.—Normal.

Ischiatic Glands, Gluteal Glands, Popliteal Glands, Precrural Glands, Pudic Glands, Iliac Glands, Ilio-Sacral, Lumbar Glands, Renal Glands, Axillary Glands, Submaxillary Glands, Pharyngeal Glands, Parotid Glands.—Normal.

Gastric Glands, Mesenteric Glands, Colic Glands.—Normal.

Microscopical Examination.

Cervical Gland (softened nodule).—A few tubercle bacilli.

Portal Gland.—Sixteen tubercle bacilli found.

Coeliac Gland.—No tubercle bacilli.

CALF 330.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VI. through Guinea-pig 1,015

Date—September 2nd, 1905.

Dose—50 milligrammes.

Weight—2 qrs. 9 lbs. Age, 6½ weeks.

Died—October 4th, 1905. 32 days after inoculation

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 2nd, 1905.

Eleven days later there was a firm, flattened tumour measuring 4½ in. by 3 in. in superficial area and about ¾ in. in greatest thickness; the left prescapular gland measured 3 in. in length.

On September 22nd, 1905, 18 days after inoculation, the tumour had increased in area and thickness, measuring superficially 6 in. by 3½ in.; the inferior part of the tumour tapered and extended into the loose tissues on the side of the trachea; the prescapular gland was 4 in. in length.

The calf was first noticed to be ill on September 30th, 1905, 28 days after inoculation; the respiration was slightly increased, there was occasional cough, and the animal had obviously lost flesh.

The illness rapidly became more acute and the calf died on October 4th, 32 days after inoculation.

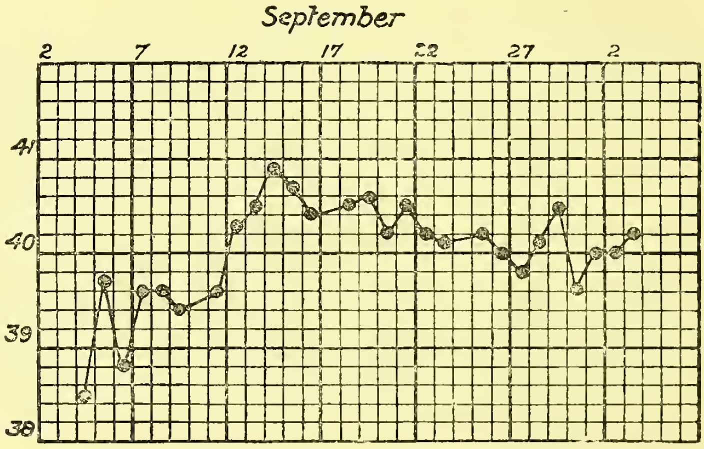
Weights.

The calf at first gained in weight; during the last 15 days there was a loss in weight of 17 lbs.

	qrs.	lbs.
September 5th, 1905	2	9
September 19th, 1905	2	18
September 26th, 1905	2	14
October 4th, 1905	2	1

Loss in weight on the initial weight.—8 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Seat of Inoculation.—In the subcutaneous tissues on the left side of the neck was a flattened tumour, measuring 5 in. by 3¼ in. by 1¾ in., and which weighed with the skin attached to it, 10 ozs. It was composed of firm yellowish caseo-necrotic tissue, infiltrating the skin and muscle, with a small cavity in the centre containing turbid fluid.

Left Prescapular Gland.—Weighed 4 ozs., and measured 3 in. by 2¼ in. by 1½ in., and was composed throughout of dense yellowish caseous tissue.

Right Prescapular Gland.—Contained caseous tubercles, up to 2 millimetres.

Left Prepectoral Glands.—One contained a few irregular caseous tubercles; the small round gland had about one third of the cortex infiltrated with yellow caseous foci.

Right Prepectoral Gland.—Contained a few pinhead caseous tubercles.

Cervical Glands.—One on the left side showed about half the cortex caseous, with discrete tubercles in the rest of the gland. A second gland, about two inches from the thorax, was firm and caseous throughout.

On the right side the glands contained irregular caseous tubercles.

Abdomen:

Omentum.—On the omentum were sparsely scattered flattened grey tubercles, varying in size up to 2 millimetres. They were opaque in the centre, loosely attached, and some deeply congested.

Spleen.—Weighed 10 ozs. It was firm, and on section contained closely aggregated yellow caseous tubercles from 2 to 3 millimetres in diameter.

Liver.—Scattered throughout the liver were fairly numerous tubercles, varying in size. The majority were minute and grey; the largest, up to 1 millimetre, were opaque and slightly yellow.

Portal Glands.—Three in number, contained irregular caseating nodules in the cortices and medulla, replacing a large part of their substance.

Gall Bladder.—Under the mucous membrane of the gall bladder were seven small opaque tubercles, a little less than a pinhead in size.

Kidneys.—Contained sparsely scattered grey tubercles; the largest, up to 1·5 millimetre in diameter, were opaque and caseous in the centre. The tissues around the left kidney were œdematous.

Suprarenals.—The left suprarenal gland contained two minute grey foci.

In the right suprarenal gland there was one grey tubercle, and a caseous nodule the size of a wheat grain.

Thorax:

Heart.—There was one grey tubercle in the muscle of the right ventricle. The heart was otherwise normal.

Lungs.—Part of the cephalic lobe of the left lung and the anterior part of the caudal were dark and firm, and sank in water. The substance was fairly closely filled with irregular yellowish tubercles with grey margins, the majority about a pinhead in size, the largest 1·5 millimetre in diameter.

The cephalic and middle lobes of the right lung were congested and firm, but still contained air.

Bronchial Glands.—The right bronchial gland was filled throughout with a close network of yellow caseous tissue. The left had the cortex caseous.

Mediastinal Glands.—In the dorsal mediastinal glands the cortices were practically replaced by yellow caseous tissue, with a few discrete caseous tubercles in the medulla.

A small infratracheal gland was about half caseous.

Tonsils.—In each tonsil was an irregular ulcerated area about a quarter of an inch in diameter.

Tongue.—There was a yellow tubercle on the left side of the tongue.

Larynx, Trachea.—In the larynx were two small opaque tubercles, and three down the trachea.

Parotid Salivary Glands.—Normal.

Small Intestine.—Beneath the mucous membrane were small tubercles, sparsely scattered along the whole length. They were more numerous in the Peyer's patches.

Large Intestine.—Normal.

Mesenteric Glands.—Were enlarged, and contained small caseous tubercles in the cortices; in some of the glands they were very numerous, forming a more or less close caseous network.

Gastric Glands, Pyloric Glands.—Contained numerous minute yellow foci.

Ileo-Colic Glands.—One ileo-colic gland had the cortex diffusely caseous.

Various Lymphatic Glands :

Iliac, Gluteal, Axillary, Popliteal, Ilio-Sacral.—Contained irregular yellow caseous tubercles.

Lumbar.—Showed a cortical margin of caseation formed by coalescing tubercles; one was congested.

Precrural, Submaxillary, Parotid.—Contained numerous small irregular caseous tubercles.

Microscopical Examination.

Tongue.—Seven tubercle bacilli.

Tonsil.—A few tubercle bacilli.

Heart.—Twelve tubercle bacilli.

Suprarenal.—One tubercle bacillus.

COW 300.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VI. through Guinea-pig 1,015.

Date—September 2nd, 1905.

Dose—100 milligrammes.

Weight—5 cwt. 1 qr. 15 lbs.

Died—October 2nd, 1905. 30 days after inoculation.

Clinical History.

The cow was inoculated subcutaneously on the left side of the neck on September 2nd, 1905.

Four days after inoculation there was a slightly raised, tender local swelling, 3 in. in diameter; the prescapular gland was appreciably enlarged. On September 13th, 1905, 11 days after inoculation the tumour was more raised, and measured 5 in. by 4 in. in superficial area. Subsequently the tumour became more prominent, but increased in area only to a slight extent.

The prescapular gland enlarged considerably, and measured at the end of three weeks 6 in. in long diameter; the spherical prepectoral gland was the size of a bagatelle ball.

Constitutional symptoms were first noticed about the 16th day; the coat was staring and there was some loss of appetite. From this date the progress of the disease was rapid. The respiration became greatly increased, and finally laboured, and there was frequent cough and rapid emaciation, the average loss in weight per day being 5·4 lbs.

The cow died suddenly on October 2nd, 1905, 30 days after inoculation.

Weights.

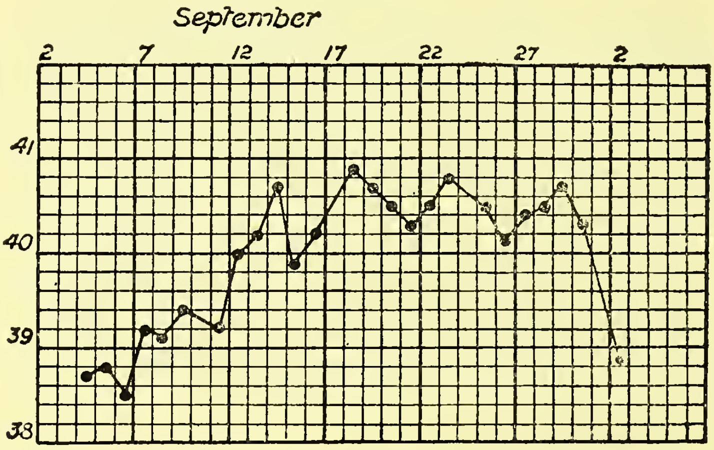
There was a steady loss in weight.

	cwt.	qrs.	lbs.
September 5th, 1905 - - -	5	1	15
September 12th, 1905 - - -	5	0	21
September 19th, 1905 - - -	4	3	25
September 26th, 1905 - - -	4	1	17
October 2nd, 1905 - - -	4	0	9

Loss in weight.—1 cwt. 1 qr. 6lbs.

Average loss per day.—5·4 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Poor.

Local Tumour.—Weighed with the skin 14 ozs., and measured $5\frac{1}{2}$ in. by $2\frac{3}{4}$ in. by $1\frac{1}{2}$ in., and was adherent to the skin and muscle. It was composed of caseous tissue, firm round the margins and spongy in the centre, which was of a dark pinkish colour, with turbid fluid in the interstices.

Left Prescapular Gland.—Was enlarged; cortex firm, contained a close casous network, with small yellowish foci. The medulla was congested, and contained a few caseous tubercles. The gland measured 5 in. by $2\frac{1}{4}$ in. by $2\frac{1}{2}$ in.

Left Prepectoral Gland.—Was about the size of a pigeon's egg, and was firmly caseous throughout.

Right Prescapular Gland.—Contained several minute opaque tubercles.

Cervical Glands.—On either side contained a few opaque tubercles, varying in size up to a pin's head.

Abdomen :

Diaphragm.—On the peritoneal surface of the diaphragm there were some flattened translucent tubercles, with opaque centres.

Spleen.—Weighed $1\frac{1}{2}$lbs., and was almost diffluent. It contained a moderate number of scattered miliary tubercles.

Liver.—Was soft, and only a single grey tubercle could be seen.

Portal Glands.—In the portal glands no tubercles were visible; they were extremely soft and slightly decomposed.

Gall Bladder.—Normal.

Kidneys.—The left kidney contained five grey tubercles, up to a pinhead in size.

The right kidney contained one opaque, slightly yellow tubercle.

Suprarenals.—The suprarenal glands were normal.

Renal Glands.—Were soft, and contained a few miliary tubercles with opaque centres.

Thorax :

Heart.—Normal.

Pericardium.—Contained a small amount of blood-stained fluid.

Pleura.—On the parietal pleura there were four flattened loosely attached translucent tubercles, opaque in the centre, up to 1·5 millimetre in diameter.

Lungs.—Were very emphysematous; large blebs of gas could be seen beneath the pleura, extending into and distending the interlobular connective tissue.

The right anterior and middle lobes were congested and solid. The left anterior lobe was congested, but floated in water. The substance of all the lobes was closely filled with grey tubercles, about the size of small shot, with opaque yellowish centres.

There was considerable emphysema of the tissues in the dorsal mediastinum.

Bronchial Glands, Infra-tracheal Glands.—Showed no tubercles.

Mediastinal Glands.—Were extremely soft and discoloured, and contained gas. In some of them four or five faintly yellow tubercles, about the size of a millet seed, could be seen ; in the others no tubercles were visible.

Pharynx, Larynx.—Appeared normal.

Parotid Glands.—In the left parotid salivary gland there were four opaque pinhead tubercles, and three similar tubercles in the lymphatic gland.

The right parotid salivary and lymphatic glands appeared normal.

Posterior Pharyngeal Glands.—Were congested and contained numerous minute opaque foci.

Intestines.—Appeared normal.

Mesenteric Glands.—Were soft and œdematous, and a few minute opaque tubercles could be seen in each.

Various Lymphatic Glands :

Gluteal, Ischiatic, Popliteal, Axillary, Submaxillary, Lumbar, Iliac, Precrural, Supramammary, Sacro-Iliac, Cœliac.—Each contained a few opaque, yellowish tubercles, varying in size up to that of a pin's head.

Microscopical Examination.

Liver (grey tubercle).—A few tubercle bacilli.

Udder.—No tubercle bacilli.

Mesenteric Gland	Moderate number of tubercle bacilli.
Ischiatic Gland	
Thoracic Gland	

Right Bronchial Gland	Numerous tubercle bacilli.
Gland at Entrance to Thorax	

LIST OF GUINEA PIGS INOCULATED WITH MILK OF COW 300.

Dose of milk in each case: 5 cc (not centrifugalised).

Date.	Number of Guinea-pig.		Duration of Life in Days.		Killed or Died.	Result.
			Intraperitoneal.	Subcutaneous.		
September 1st 1905, (before inoculation of Cow.)	1660	R.F.		39	K	Healthy
	1661		36		D	No tuberculosis.
	1662	L.H.		39	K	Healthy
	1663		39		K	Healthy.
	1664	L.F.		39	K	Healthy.
	1665		39		K	Healthy.
	1666	R.H.		39	K	Healthy.
	1667		39		K	Healthy.
September 9th, 1905, (7 days after inoculation)	1681	R.F.		41	K	Small local lesion: tuberculosis of inguinal and portal glands: numerous T.B. in both latter.
	1682		25		D	No tuberculosis.
	1683	L.H.		41	K	No tuberculosis.
	1684		5		D	No tuberculosis.
	1685	L.T.		31	D	No tuberculosis.
	1686		41		K	Tuberculosis of omentum, spleen, liver and many lymphatic glands: T.B. found in a lumbar gland.
	1687	R.H.		31	D	No tuberculosis.
	1688		41		K	Small local lesion: minute point in left inguinal gland: sternal gland caseous (T.B.)
September 18th 1905, (16 days after inoculation)	1693	R.F.		7	D	A few T.B were found in the local lesion: inguinal glands normal.
	1694		19		D	No tuberculosis.
	1695	L.H.		42	K	No tuberculosis.
	1696		7		D	No tuberculosis.
	1697	L F.		42	K	No tuberculosis.
	1698		42		K	Tuberculosis of omentum, spleen and liver; many lymphatic glands extensively caseous: T.B. in spleen, omental and portal glands.
	1699	R.H.		42	K	Local lesion: right inguinal and portal glands were caseous: T.B. in portal gland.
	1700		19		D	No tuberculosis.
September 23rd 1905, (21 days after inoculation)	1709	R.F.		38	D	Local ulcer: inguinal, portal and coeliac glands caseous (T.B.): 3 tubercles in spleen (T.B.)
	1710		40		D	General tuberculosis.
	1711	L.H.		77	D	General tuberculosis: lungs slightly affected.
	1712		73		D	General tuberculosis.
	1713	L.F.		70	D	General tuberculosis: lungs only slightly affected.
	1714		14		D	No tuberculosis.
	1715	R.H.		42	D	Small local lesion: caseation of right deep inguinal and iliac glands T.B. in both.)
	1716		79		K	No tuberculosis.
September 30th 1905, (28 days after inoculation)	1719	R.F.		62	D	General tuberculosis.
	1720		32		D	General tuberculosis.
	1721	L.H.		60	D	General tuberculosis.
	1722		33		D	Slight tuberculosis.
	1723	L.F.		61	D	General tuberculosis: two tubercles in lungs.
	1724		66		D	General tuberculosis.
	1725	R.H.		32	D	Carcass partly eaten: sternal and right axillary glands were caseous: T.B. in former.
	1726		32		D	General tuberculosis.
October 2nd 1905, (30 days after inoculation)	1727	R.F.		39	D	Slight tuberculosis.
	1728		26		D	Carcass eaten.
	1729	L. H.		59	D	General tuberculosis: not severe.
	1730		43		D	General tuberculosis.
	1731	L.F.		57	D	General tuberculosis.
	1732		39		D	General tuberculosis.
	1733	R.H.		29	D	Carcass eaten
	1734		42		D	General tuberculosis.

VIRUS B VII.

May 24, 1904.

MESENTERIC GLANDS.

Several tuberculous mesenteric glands were sent. One large gland was entirely caseous and softened. The others contained caseous nodules of various sizes which were either soft in the centre or gritty on section.

VIRUS B. VIII.

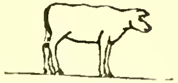
(May 24, 1904.)

MESENTERIC GLAND.

CULTURE INOCULATIONS.

Inoculated February 14, 1905, with culture derived from the original material, through Guinea-Pig 1017.

The culture used was the 6th generation, 20 days old, and had been in cultivation a total period of 247 days.



CALF 236.

Subcutaneous.

Dose : 50 mg.

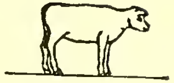
Killed, dying, March 20, 1905

(34 days).

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result
173	1·0 mg.	Intravenous	D. 15 days	G.T.
175	1·0 „	Intraperitoneal	D. 17 „	G.T.
176	1·0 „	Intraperitoneal	D. 19 „	G.T.
174	0·1 „	Intraperitoneal	D. 81 „	G.T.
177	1·0 „	Subcutaneous	D. 63 „	G.T.
178	1·0 „	Subcutaneous	D. 81 „	G.T.



CALF 238.

Subcutaneous.

Dose : 50 mg.

Died, March 8, 1905

(22 days).

P.M.—General tuberculosis.

CALF 236.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VII., through Guinea-Pig 1017.

Date—February 14th, 1905.

Dose—50 milligrammes.

Age—11 weeks.

Killed—Dying, March 20th, 1905. 34 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on February 14th, 1905.

Seven days later there was a flat subcutaneous thickening, 3 in. by 2 in.; the left prescapular gland measured 3 in. in length.

On March 2nd, 1905, the tumour attained its maximum; it was slightly raised, pear-shaped in outline and measured 5 in. from above downwards by 2¾ in. in greatest width; the prescapular gland was 4 in. in length and a prepectoral gland was slightly enlarged; on March 15th the latter gland became the size of a marble.

The calf showed no obvious signs of ill-health until March 6th, 1905, 20 days after inoculation, when the respirations were noticed to be slightly increased in frequency; for four days previous to this the coat was somewhat rough.

The respirations gradually became quicker and more laboured and the calf began to lose flesh and strength.

On March 19th, 1905, the respirations were sixty-eight per minute and very laboured, and the calf was too weak to rise from the ground. On the next day it was much weaker and was obviously dying when killed.

Weights.

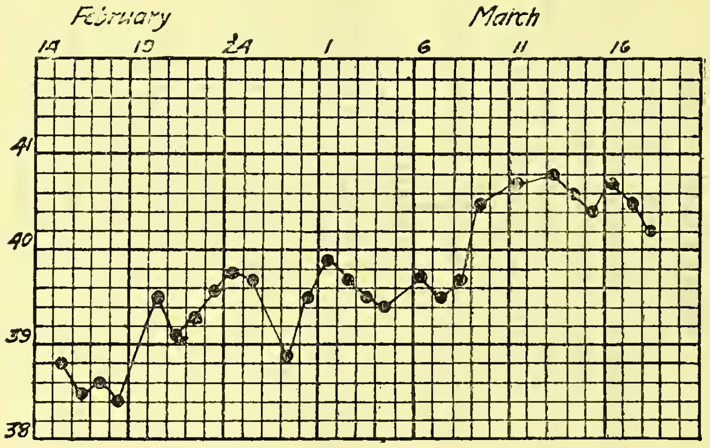
The calf was weighed first a week after inoculation; from February 21st to March 7th (14 days) there was a loss in weight of 2 lbs.; subsequently the loss in weight was more rapid, 20 lbs. in 13 days.

	qrs.	lbs.
February 21st, 1905 - - - - -	3	16
March 7th, 1905 - - - - -	3	14
March 14th, 1905 - - - - -	3	9
March 20th, 1905 - - - - -	2	22

Loss in weight.—22 lbs.

Average loss per week.—5–7 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a small tumour (4 in. by 2 in. by 1 in.), which weighed, with the skin and muscles to which it was adherent, about 5 ozs. On section it was composed of the usual pinkish yellow caseo-necrotic tissue, showing in the central part little cavities filled with reddish serous fluid. The skin was infiltrated with caseous tubercles only in the deeper layers. The superficial muscles were studded with caseous tubercles, and showed at one part a wedge of dense caseous tissue continuous with the centre of the local tumour.

Between the local tumour and the prepectoral glands there was a caseous lymphatic vessel, the thickness of a cedarwood pencil.

Left Prescapular Gland.—Weighed about 2½ ozs and measured 2¾ in. by 1½ in. by 1½ in. On section, except for a small patch in the centre of firm translucent tissue studded with caseous tubercles, it consisted throughout of dense pinkish yellow caseated tissue.

Prepectoral Glands.—The spherical prepectoral gland was 1·5 centimetre in diameter, and was composed of translucent grey tissue, closely studded with caseous foci.

The kidney-shaped gland, the size of a broad bean, contained numerous shot-sized caseous tubercles.

Cervical Glands.—The lower cervical gland, the size of a small bean, was caseous throughout. A gland similar in size, in the middle of the neck, showed half its substance dense and caseous, and in the rest caseous tubercles.

Other cervical glands on the left side, and all those on the right, were beset with caseous tubercles.

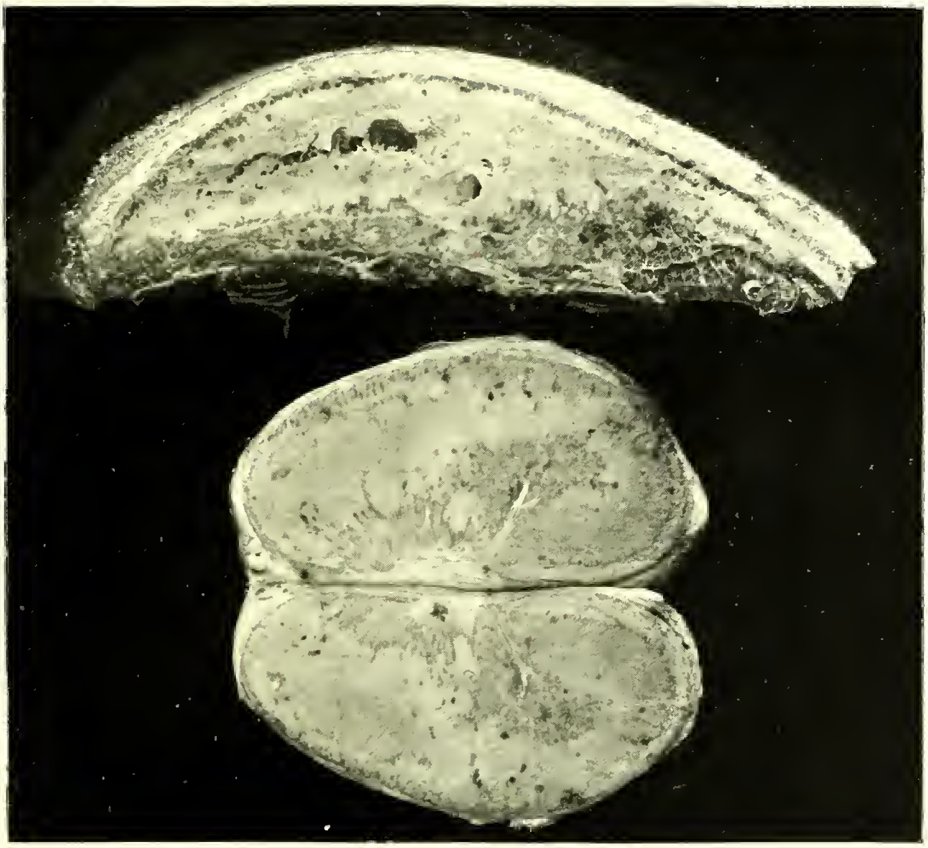
Abdomen :—

Omentum.—On the inferior surface of the omentum there was a considerable number of nodules, ranging in size from a pin's head to that of a split pea; the larger ones were somewhat flattened and had yellow centres; into some of the nodules hæmorrhage had occurred.

Peritoneum.—The peritoneum covering the diaphragm on the right side, and the serous surface (in contact with the liver) of the stomach near the œsophagus, was covered with an eruption of "mushroomed" nodules, the largest 3 millimetres in diameter.

Spleen.—Was enlarged and firm and weighed 13 ozs. On section it was very closely packed with caseous tubercles, the largest 2 millimetres in diameter.

Liver.—3 lbs. 13 ozs. Substance was closely beset with small opaque tubercles: these projected very slightly on the surface. On the surface of the thin left lobe, where in contact with the stomach and the diaphragm, there were numerous projecting nodules similar to those on the diaphragm, but smaller.



CALF 236. Subcutaneous. Virus B. VII.

Local lesion and adjacent prescapular gland.

Portal Glands.—Were much enlarged, soft and œdematous. On section they showed in the cortices confluent masses of cascating tubercles.

Gall Bladder.—Distended with bile: showed on the mucous surface numerous caseous tubercles and small ulcers; each of the latter was covered with a little mass of bile-stained mucus.

Kidneys.—Left kidney showed on the surface numerous tubercles (from eight to sixteen on the surface of each large lobule), ranging in size from a mustard seed to a millet seed; the tubercles were caseous in the centre, and were seen in the depth of the cortex as well as on the surface.

The right kidney showed similar tubercles.

Suprarenal Bodies.—In the cortex of each there were about a dozen opaque mustard seed-sized tubercles.

Thorax:—

Heart—There was one tubercle on the pericardium covering the aorta. Under the pericardium on the left ventricle there were four small tubercles: each appeared to have originated in a lymphatic vessel. In the muscle under the endocardium of the left ventricle there were two small tubercles, and under that of the right one.

Pleura.—On the parietal pleura there were a few small flattened nodules; these occurred in the midst of slightly hypertrophied lymphatic fringes, and were situated chiefly near the vertebral column.

There were a few small tubercles on the diaphragm, and on the mediastinal pleura.

Lungs.—Were diffusely consolidated, the caudal lobes and the cephalic lobes being equally affected; the surfaces of the lungs had a mottled appearance The substance of the lungs was crowded with caseous miliary tubercles. On section the lung tissue exuded frothy œdema fluid, chiefly from the large bronchi. There were no tubercles in the fringes around the margins of the lungs.

Thoracic Glands.—The caudal mediastinal gland was enlarged; the cortex was closely beset with caseating tubercles, which had practically everywhere become confluent; the medulla was congested, and showed discrete tubercles.

The glands in the dorsal mediastinum, anterior to the latter, were similarly affected.

The bronchial glands were considerably enlarged, and slightly more severely affected than the mediastinal.

The infra-tracheal glands resembled the mediastinal.

Ventral Mediastinal Glands.—Two above the manubrium sterni, and two at the apex of the heart, were beset with caseous tubercles.

All the vertebral glands showed caseating tubercles.

Alimentary Tract.

Tongue.—Some of the lymphoid follicles at the base of the tongue and in the pharynx were enlarged, and had yellow centres.

The tonsils contained caseous tubercles.

Pharynx.—There were several caseous tubercles in the corrugated mucous membrane in the vault of the pharynx, and there were four in the wall of the upper portion of the oesophagus.

Stomach.—The solitary lymphoid follicles in the mucous membrane of the stomach appeared enlarged, and on section showed opaque centres.

Intestines.—The long Peyer's patch and the mucous membrane around it were closely studded with caseous tubercles; as the anterior end was approached these got fewer and fewer in number, some of the early patches containing only one or two tubercles.

The solitary follicles in the large intestine were slightly enlarged, and appeared to have opaque yellow centres.

Bladder.—Under the mucous membrane there were three pinhead-sized tubercles.

Trachea, Larynx, Brain, Eyes.—Normal.

Mammary Gland.—Appeared normal.

The following lymphatic glands were closely beset with discrete caseous miliary tubercles:—

Parotid, Submaxillary, Pharyngeal, Mastoid, Axillary, Right Prepectoral, Right Prescapular, Precrural, Popliteal, Gluteal, Ischiatic, Œsophageal, Pudic, Iliac, Ilio-Sacral, Lumbar.

Cœliac Glands.—Were enlarged, and showed caseating masses and discrete tubercles.

Right Renal Lymphatic Gland.—Was packed with caseous tubercles tending to become confluent.

Several hæmo-lymph glands contained tubercles.

Microscopical Examination.

Hæmo-Lymph Gland.—No tubercle bacilli.

Left Suprarenal Body *Bladder*	Numerous tubercle bacilli.

Tongue.—No tubercle bacilli.

Heart.—A few tubercle bacilli.

Stomach.—Numerous tubercle bacilli.

Large Intestine.—No tubercle bacilli.

CALF 238.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VII., through Guinea-Pig 1017.

Date—February 14th, 1905.

Dose—50 milligrammes.

Age—11 weeks.

Died—March 8th, 1905. 22 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on February 14th, 1905.

Seven days later there was a firm infiltrating tumour 3 in. in diameter and about half an inch in greatest thickness; the left prescapular gland measured 2 in. in length; a prepectoral gland was the size of a marble.

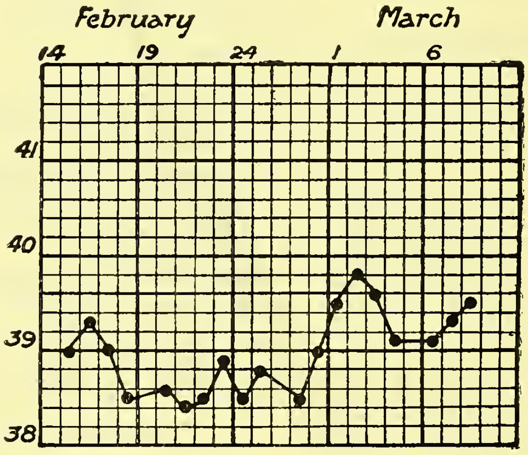
On March 2nd, 1905, 16 days after inoculation, the tumour was more prominent and measured 5 in. by 4 in. in superficial area; the prescapular gland was about 3½ in. in length. On this date the animal's coat was noticed to be 'staring,' but there were no other signs of ill-health, until four days later, when the respirations were observed to be distinctly increased in frequency. The respirations rapidly became more frequent, and on the morning of the 8th of March the calf showed all the signs of acute respiratory distress; during the day the dyspnœa became more urgent and the calf died suddenly in the afternoon.

Weights.

	qrs.	lbs.
February 21st, 1905 - - - - -	3	3
February 28th, 1905 - - - - -	3	3
March 7th, 1905 - - - - - -	3	0

Loss in Weight.—3 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was an elastic tumour which measured 5 in. by 3¾ in. by 2 in. On removal and section it was found to contain a large lenticular cavity, which replaced the greater part of the centre of the tumour; the walls of the cavity were formed by pinkish yellow caseo-necrotic tissue, rough and shreddy on the internal surface; the cavity was filled with clear reddish serous fluid; both the skin and muscle were infiltrated, the skin at one point showing caseation almost up to the surface. There was a moderate amount of œdema and congestion around the local tumour.

Left Prescapular Gland.—Weighed about 2 ozs., and measured 2½ in. by 1¾ in. by 1¼ in. On section it consisted throughout of dense pinkish yellow caseated tissue.

Left Prepectoral Glands.—The rounded prepectoral gland measured two-thirds of an inch in diameter, and was very hard. On section it resembled the prescapular gland. The kidney-shaped prepectoral gland was enlarged and œdematous, and showed a small patch of caseation and several caseous foci. A deeper gland, the size of a pea, was indurated, and showed early foci of caseation in the cortex.

Left Cervical Glands.—Near the mastoid process there were two glands; one was greatly enlarged, firm, and well advanced in caseation (less than the prescapular); the other was the size of a broad bean, and beset with caseous foci. Along the left carotid artery there was a series of four enlarged indurated glands, the largest the size of a filbert; these on section resembled the large gland near the mastoid.

Abdomen:—

Omentum.—The omentum had on its inferior surface a considerable number of grey tubercles, the size of pins' heads.

Spleen.—Weighed 6 ozs., and was very little enlarged. On section the pulp was firm, and closely packed with small grey tubercles.

Liver.—Weighed 2 lbs., 2 ozs.; it was purplish in colour, and evenly and closely peppered with minute greyish white tubercles.

Gall Bladder.—Was distended with bile, and showed on the mucous surface a few minute tubercles.

Portal Glands.—Were enlarged, and showed in the cortices firm grey tissue, speckled with minute opaque foci.

Kidneys.—Each kidney showed on the surface, as well as in the depth of the cortex, numerous minute greyish white tubercles.

Suprarenal Bodies.—Had a few minute opaque tubercles in the cortical zones.

Thorax:—

The pericardial sac contained a small amount of clear serous fluid.

Heart.—On the endocardium of the right ventricle there was a number of minute pearly tubercles, the size of grains of sand; there were one or two similar tubercles on the endocardium of the left ventricle. No tubercles were seen in the heart muscle.

Pleura.—Normal.

Lungs.—The lungs were heavy, the cephalic lobes and the antero-ventral portions of the caudal being completely hepatised; the posterior portions of the caudal lobes showed an earlier stage of consolidation, the cut surfaces exuding frothy œdema fluid from the centres of the alveoli; externally the caudal lobes bore the impress of the ribs.

The lung tissue was everywhere very closely beset with minute grey tubercles.

The bronchi in the cephalic lobes were plugged with whitish muco-pus.

Mediastinal Glands.—Were moderately enlarged. On section they showed in the cortices firm grey tissue permeated with a fine whitish network; the medullary zones were congested.

The bronchial and peribronchial glands were similarly affected.

Tongue, Pharynx, etc.—The mucous membrane of the pharnx, base of the tongue, and larynx showed a few very early foci.

One or two very minute grey tubercles were seen also on the mucous membrane of the trachea.

Each tonsil showed a few minute whitish specks.

Small Intestine.—One or two minute foci were seen in almost every Peyer's patch in the small intestine.

Large Intestine.—Normal.

The following lymphatic glands were examined, and found to contain numerous discrete greyish white foci:—

Gluteal, Popliteal, Precrural, Pudic, Iliac, Ilio-Sacral, Axillary, Right Prescapular, Right Prepectoral, Submaxillary, Retropharyngeal, Parotid, Gastric, Mesenteric, Colic, Ventral Mediastinal.

Coeliac Glands, Right Renal Gland.—Were enlarged, firmer than normal, and showed minute opaque foci.

Ischiatic Glands.—Each contained one or two small foci.

Most of the hæmo-lymph glands examined showed similar foci.

Eyes.—Normal.

Testicles.—Normal.

Microscopical Examination.

Left Suprarenal } A few tubercle bacilli.
Gall Bladder - }

Small Intestine:—

Tubercle in Peyer's Patch.—Numerous tubercle bacilli.

Scraping of Mucous Membrane.—A few tubercle bacilli.

Endocardium } Numerous tubercle bacilli.
Larynx - - }

Pharynx. A few tubercle bacilli.

VIRUS B VIII

May 24, 1904.

MESENTERIC GLAND.

The specimen sent was an enlarged mesenteric gland from an adult bovine; the gland was entirely caseous, softened, and slightly gritty.

VIRUS B. VIII.

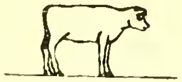
(May 24, 1904).

MESENTERIC GLAND.

CULTURE INOCULATIONS.

Inoculated on April 10, 1905, with culture derived from the original material.

The culture used was the 18th generation, 20 days old, and had been in cultivation a total period of 321 days.



CALF 254.

Subcutaneous.

Dose : 50 mg.

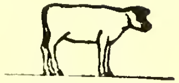
Died, April 29, 1905

(19 days).

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
258	0·1 mg.	Intravenous	D. 11 days	Early G.T.
253	1·0 ,,	Intraperitoneal	D. 20 ,,	G.T.
256	1·0 ,,	Intraperitoneal	D. 16 ,,	G.T.
255	0·1 ,,	Intraperitoneal	D. 21 ,,	G.T.
254	1·0 ,,	Subcutaneous	D. 89 ,,	G.T.
257	1·0 ,,	Subcutaneous	D. 22 ,,	S.T.



CALF 256.

Subcutaneous.

Dose : 50 mg.

Died, May 18, 1905

(37 days).

P.M.—General tuberculosis.

CALF 254.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VIII.

Date—April 10th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 16 lbs. [Age—9½ weeks.]

Died—April 29th, 1905. 19 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 10th, 1905.

Nine days later there was at the site of inoculation a slightly raised firm swelling 4 in. by 3 in.; the prescapular gland on the same side measured 3 in. in length and one of the prepectoral glands was slightly enlarged.

On April 28th, 1905, 18 days after inoculation, the respirations became suddenly increased in frequency. Next morning the breathing was more rapid and there was acute respiratory distress; the calf lay on the floor with head and neck extended to the fullest extent, all the accessory muscles of respiration being brought into action; at twelve noon the calf died suddenly, 19 days after it was inoculated.

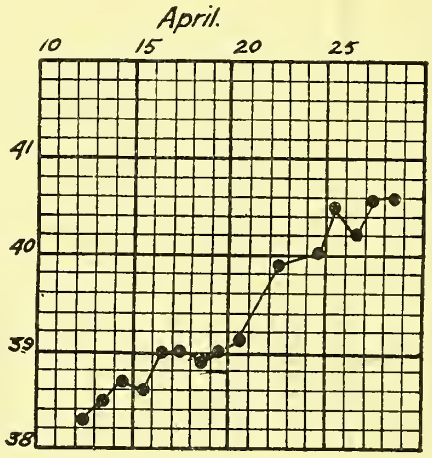
Weights.

During the first eight days there was a gain in weight of 10 lbs.; from April 19th to April 29th the calf lost 13 lbs.

	qrs.	lbs.
April 11th, 1905 - - - - -	3	16
April 19th, 1905 - - - - -	3	26
April 25th, 1905 - - - - -	3	15
April 29th, 1905 - - - - -	3	13

Loss of weight on the initial weight.—3 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a plano-convex swelling which measured 4½ ins. vertically, 3 ins. from before backwards, and 1 in. in greatest thickness. On section it was composed of rather dark reddish yellow juicy necrotic tissue, adherent to and slightly infiltrating the superficial muscles. The skin was firmly adherent, but showed definite infiltration only at one point.

Left Prescapular Gland—Weighed 3 ozs., and measured 3½ in. by 2¼ in. by a little over 1 in. On section it consisted practically throughout of dense grey translucent tissue, closely penetrated with a yellow network of caseation; at one extremity of the gland a small patch of cortex showed little groups of grey tubercles in a very early state of caseation.

Right Prescapular Gland.—Was congested and œdematous, and showed in the cortex fairly numerous caseous foci, each of which was surrounded by a zone of congestion.

Left Prepectoral Glands.—The spherical prepectoral gland measured about 2 centimetres in diameter. On section it was dense and caseating throughout.

Two deeper prepectoral glands showed a few minute caseous foci.

Right Prepectoral Glands.—Contained each a few minute caseous foci.

Cervical Glands.—Two superior cervical glands on the left side and a gland two inches posterior to the larynx were slightly enlarged, and showed part of their cortex composed of firm greyish-red tissue in a state of early caseation; in other parts of the glands there were scattered minute caseous foci.

Other cervical glands on the left side, and all those on the right, contained a few minute congested caseous foci.

Abdomen :

Omentum.—On the inferior surface of the omentum there were a few pinhead-sized tubercles.

Spleen.—Weighed 8½ ozs. No tubercles on the surface; on section the pulp was soft and dark red; a few very small tubercles could be seen sparsely scattered throughout, and close examination revealed some grey points, which may have been early tubercles.

Liver.—Was enlarged, pale, and soft; the substance was closely beset with minute grey tubercles, many of which were barely visible to the naked eye.

Portal Glands.—Were enlarged and œdematous, and showed on section small grey areas, irregular in outline, made up apparently of groups of small tubercles.

Gall Bladder.—Normal.

Kidneys.—The left kidney showed in the cortex scattered very minute grey tubercles.

The right kidney was similarly affected.

Suprarenal Bodies.—Normal to the naked eye.

Thorax :

The pleural cavities contained a few cubic centimetres of clear serous fluid.

The fringes along the margins of the ribs, and around the margins of the tendon of the diaphragm, were congested and perhaps slightly hypertrophied; in some of them minute grey granules could be seen and felt.

Heart.—There were numerous petechial points of hæmorrhage in the muscle substance. On the endocardium of the right ventricle there were several minute pearly grey tubercles.

Lungs.—The lungs were extensively consolidated, the cephalic lobes and the greater portions of the caudal lobes being dark red, heavy, and quite airless; the posterior parts of the caudal lobes were diffusely congested, and exuded from their cut surfaces frothy blood-stained œdema fluid. The lung tissue was closely beset throughout with minute grey tubercles few of which exceeded 0·5 millimetres in diameter.

Mediastinal Glands.—The dorsal mediastinal glands were moderately enlarged; the caudal gland showed the cortex composed of firm grey translucent tissue in a state of very early caseation; the other glands were similar, but perhaps slightly more advanced in caseation.

Bronchial Glands, Infra-tracheal Glands.—Were enlarged, and resembled on section the dorsal mediastinal glands.

Tonsils.—Several of the tonsillar crypts contained soft yellow secretion, but there were no definite tubercles in the substance.

The mucous membranes of the pharynx, larynx, and trachea were normal to the naked eye.

Intestines.—Mucous membrane congested; no tubercles were seen.

Gastric Glands, Mesenteric Glands, Colic Glands.—Showed in a few instances suspicious grey foci.

Urinary Bladder, Testicles, Eyes.—Normal.

Various Lymphatic Glands:

Gluteal, Popliteal, Precrural, Pudic, Iliac, Ilio-Sacral, Submaxillary, Pharyngeal, Parotid, Ventral. Mediastinal, Axillary.—Contained each a few minute caseous foci, many just macroscopically visible; most of the larger foci were congested around the periphery.

Renal Gland, Lumbar Glands.—Contained numerous very small caseous tubercles.

Coeliac Glands.—Were oedematous, and showed some minute grey points (tubercles).

Microscopical Examination.

Precrural Gland.—Moderate number of tubercle baciili.

Liver, Spleen.—A few tubercle bacilli seen.

Kidney, Heart, Tonsil, Bone Marrow, Rib, Femur.—No tubercle bacilli.

CALF 256.

Subcutaneous—Inoculation of culture derived from the original material of Virus B VIII.

Date—April 10th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 16 lbs. [Age—9½ weeks.]

Died—May 18th, 1905. 37 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 10th, 1905.

Nine days later there was a slightly elevated firm tumour measuring 3½ in. by 3 in.; the left prescapular gland was about 2½ in. in length; a prepectoral gland on the same side was the size of a large marble.

On May 2nd, 1905, 22 days after inoculation, the tumour had attained a very large size; it was prominent, firm and extended into the dewlap and measured 7 in. from above downwards by 4 in. in greatest width; the prescapular gland was much enlarged and measured 4½ in. in length; the prepectoral gland was the size of a walnut; on this date signs of illness were first observed, the coat was rough, the rate of respiration was slightly increased and the calf seemed to be losing flesh.

The tumour showed no further increase in size, and became somewhat pendulous; the skin over it remained intact.

The respirations gradually became more frequent (rate on May 10th 60 per minute) and more and more laboured; there was frequent cough, and the calf gradually lost appetite, flesh and strength, and died on May 18th, 1905, 37 days after inoculation.

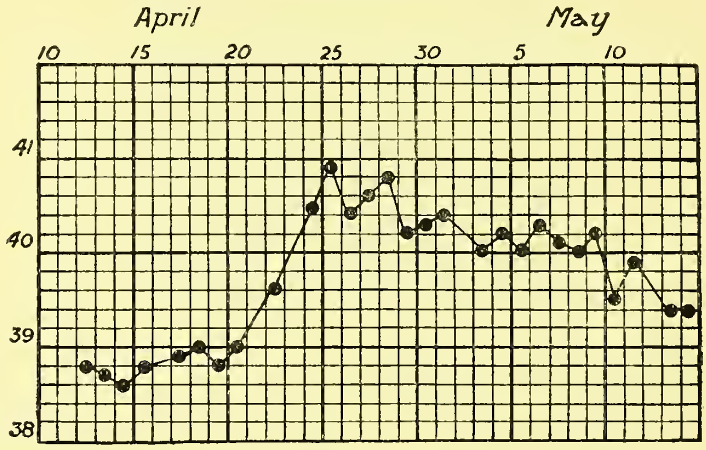
Weights.

From April 11th to April 19th, 1905, there was a gain in weight of 5lbs.; from April 19th to May 17th, 1905, the calf lost 31 lbs.

	qrs.	lbs.
April 11th, 1905 - - - - -	3	16
April 19th, 1905 - - - - -	3	21
May 2nd, 1905 - - - - -	3	16
May 10th, 1905 - - - - -	3	6
May 17th, 1905 - - - - -	2	24

Loss in weight on the initial weight.—20 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck, extending into the loose tissues under the trachea, there was a tumour measuring 6½ in. by 4 in. by 1¾ in. On section it consisted of the usual necrotic tissue, and contained in the upper half an irregular cavity filled with blood-stained serous fluid; the cavity was crossed by fibrous trabeculæ, and its walls were formed by soft masses of necrosed tissue. The skin opposite one part of this cavity showed caseous deposit right up to the surface, and was on the point of breaking down; elsewhere the skin was firmly adherent, and studded with congested caseous tubercles; the muscles under the tumour were fibroid, and beset for a depth of half an inch with small yellow caseous nodules.

Left Prescapular Gland.—Weighed 5½ ozs., and measured 4 in. by 2 in. by 2 in. On section the greater part of the cortex was composed of dense pinkish yellow caseated tissue; at the upper extremity of the gland the cortex showed grey translucent tissue in a state of early caseation.

Right Prescapular Gland.—Contained numerous discrete caseating nodules.

Prepectoral Glands.—On the left side the spherical gland was 2 centimetres in diameter, and was firm, yellow, and caseous throughout; the kidney-shaped gland showed a firm grey patch with a fine caseous network and discrete caseating nodules.

The prepectoral glands on the right side contained discrete caseating nodules.

Cervical Glands.—The left upper cervical gland was enlarged, and in one half dense and caseating; in the rest there were discrete caseating nodules. The left lower cervical, the size of a walnut, consisted throughout of dense yellow caseated tissue. A small gland attached to the capsule of the latter showed more than half of its substance in a similar condition. Other cervical glands contained caseating nodules, as in the peripheral glands.

Abdomen:

Omentum.—On the inferior surface of the omentum there was a moderate number of firm lenticular caseating nodules, the largest about 5 millimetres in diameter; they were loosely attached, and many were hæmorrhagic.

Spleen.—Weighed 12 ozs. On section firm, pulp crowded with yellow caseating nodules with congested margins, the largest about 2·5 millimetres in diameter.

Liver.—Showed on the surface fairly numerous grey tubercles with yellow centres: some of these were slightly raised above the surface and flattened out (one measured 3 millimetres across), but the majority were situated just under the capsule, or were dimly seen in the depth. On section tubercles ranging in size from a mere point up to about 1 millimetre in diameter were evenly distruted throughout the substance.

Gall Bladder.—Under the mucous membrane there were fairly numerous yellow tubercles, the largest the size of a millet seed.

Portal Glands.—Were enlarged and showed throughout the cortices grey nodular masses in a state of early caseation.

Kidneys.—The left kidney contained in the cortex fairly numerous grey tubercles, with opaque yellow centres, ranging in size from about 0·5 to 1·5 millimetre in diameter.

The right kidney resembled the left.

Suprarenal Bodies.—The left suprarenal body showed in the cortex one minute grey tubercle.

The right suprarenal appeared normal.

Thorax :

Heart.—On the pericardium covering the aorta there were two small tubercles contained in soft reddish vegetations. Heart muscle, and valves were normal.

Pleura.—Along the margins of the ribs the lymphatic fringes were in places congested, and perhaps slightly hypertrophied; they showed here and there a few grey tubercles; a few similar tubercles were seen on the diaphragm and pleural surface of the pericardium.

Lungs.—The cephalic lobes, the right middle lobe, and the antero-ventral portions of the caudal lobes had a bluish-black colour, and were practically completely airless; the rest of the caudal lobes showed diffuse patches of consolidation, and had a blotchy appearance on the surfaces; the tissue of the lungs was closely packed with grey tubercles, mostly about 1 millimetre in diameter; all the tubercles were opaque and yellow in the centre.

Mediastinal Glands.—The dorsal mediastinal glands showed a moderate degree of enlargement (weight 2½ ozs.). On section the cortices were composed of firm grey tissue penetrated with a fine yellow network of caseation; the medullæ were congested and contained discrete tubercles.

Bronchial Glands.—Were similarly affected.

An infra-tracheal gland was reddish grey on section and studded with caseous foci; two other small glands contained discrete caseating nodules.

Tonsils.—Showed caseating nodules, some softened in the centre.

Pharynx.—The mucous membrane in the vault of the pharynx contained yellow caseous tubercles; there were similar tubercles on the upper surface of the soft palate and under the pharyngeal mucous membrane around the epiglottis.

Trachea.—Distributed throughout the whole length were slightly raised congested caseous tubercles.

Small Intestine.—The long Peyer's patch contained fairly numerous pinhead-sized caseous tubercles; in other parts of the intestine they were sparsely scattered.

Large Intestine.—Appeared normal.

Eyes, Testicles.—Normal.

Bladder.—There was a small tubercle under the mucous membrane.

Various Lymphatic Glands :

Cœliac.—The largest was firm, grey, and in a state of early caseation; others were not so severely affected, containing more or less discrete caseating tubercles.

Lumbar.—In the lumbar glands there were caseating nodules, becoming confluent.

Ischiatic, Gluteal, Popliteal, Precrural, Pudic. Iliac, Ilio-Sacral, Gastric, Mesenteric, Colic, Ventral Mediastinal, Submaxillary, Parotid, Retropharyngeal. Axillary.—Contained numerous discrete caseating nodules, up to about 2 millimetres in diameter.

The hæmo-lymph glands near the right prescapular gland showed caseous tubercles.

Microscopical Examination.

Gall Bladder *Urinary Bladder*	Numerous tubercle bacilli.
Trachea *Tonsil*	Very numerous tubercle bacilli.

Suprarenal Body.—Two tubercle bacilli.

VIRUS B IX.

June 21, 1904.

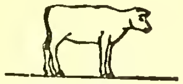
MEDIASTINAL GLANDS.

The specimens were taken from a cow apparently in good health when killed. The carcass was in good condition. The lung showed slight evidence of tuberculosis, mainly pleural. The mesenteric glands contained highly calcareous irregular nodules. A mediastinal gland was greatly enlarged and showed one caseous gritty mass and numerous large yellow nodules. The iliac glands were affected.

MEDIASTINAL GLAND.

CULTURE INOCULATIONS.

Inoculated on March 6 with culture derived from the original material.
The culture used was 12th generation, 20 days old.
The culture had been in cultivation a total period of 260 days.

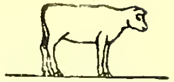


CALF 242.
Subcutaneous.
Dose : 50 mg.
Killed, ill, April 18, 1905
(43 days).
P.M.—General tuberculosis.

RABBITS.

No. of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
206	1·0 mg.	Intraperitoneal	D. 24 days	G.T.
207	1·0 „	Intraperitoneal	D. 22 „	G.T.

Inoculated on March 13, 1905 with culture derived from original material through Guinea-Pig 1069.
The culture used was 11th generation, 20 days old.
The culture had been in cultivation a total period of 249 days.

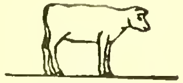


CALF 244.
Subcutaneous.
Dose : 46 mg.
Killed, dying, April 1, 1905
(19 days).
P.M.—General tuberculosis.

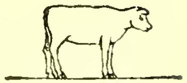
RABBITS.

No. of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
212	0·1 mg.	Intravenous	D. 18 days	G.T.
211	0·1 „	Intraperitoneal	D. 30 „	G.T.
209	1·0 „	Subcutaneous	D. 38 „	G.T.
210	1·0 „	Subcutaneous	D. 45 „	G.T.

Inoculated on September 11, 1905, with culture derived from the original material.
The Culture used was the 20th generation, 20 days old, and had been in cultivation a total period of 148 days.



CALF 320.
Subcutaneous.
Dose : 10 mg.
Died, October 18, 1905
(37 days).
P.M.—General tuberculosis.



CALF 324.
Subcutaneous.
Dose : 10 mg.
Died, October 15, 1905
(34 days).
P.M.—General tuberculosis.

Inoculated on March 29, 1906, with culture derived from the original material through Guinea-pig 1069.
The Culture used was the 25th generation, 21 days old, and had been in cultivation a total period of 630 days.

PIG 138.
Subcutaneous.
Dose : 1·0 mg.
Killed, June 20, 1906.
(92 days).
P.M.—General tuberculosis ; lungs severely affected.

CALF 242.

Subcutaneous—Inoculation of culture derived from the original material of Virus B IX.

Date—March 6th, 1905.

Dose—50 milligrammes.

Weight—1 cwt., 0 qr., 3 lbs. [Age—11½ weeks.]

Killed—When ill, April 18th, 1905. 43 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on March 6th, 1905.

On March 16th, 1905, 10 days after inoculation, there was a firm tumour measuring 5 in. by 3 in. by a little over 1 in. thick; the left prescapular gland was enlarged and measured 3½ in. in length; a prepectoral gland was slightly enlarged.

On March 22nd, 1905, the tumour had become very large and prominent and partially concealed a much enlarged prescapular gland.

On March 30th the local lesion and the gland formed a huge heavy prominent and somewhat pendulous mass, measuring 7 in. from above downwards and 7 in. from before backwards. During the rest of the experiment the tumour showed no alteration in size; it, however, became more pendulous and appeared to be undergoing softening.

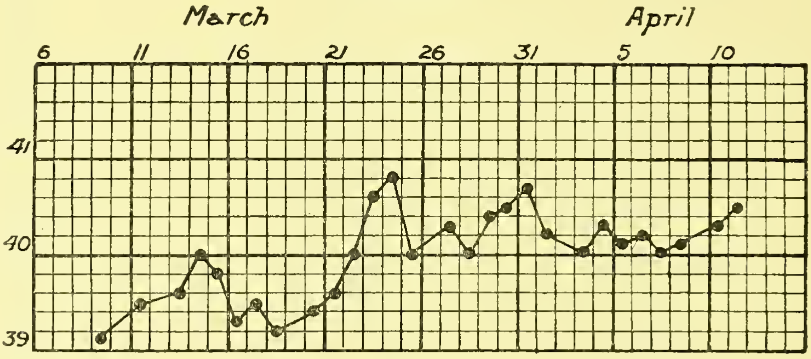
There was a gradual onset of illness. On March 30th, 1905, 24 days after inoculation, the coat was noticed to be staring, and shortly afterwards the rate of respiration became increased. The illness then followed much the same course as in other calves inoculated with 50 milligrammes of culture. The respirations, however, were never frequent, but towards the end of the experiment were somewhat laboured and jerky. When killed the animal was ill, and would probably not have lived many days longer.

Weights.

	cwt.	qrs.	lbs.
March 7th, 1905 - - - -	1	0	3
March 14th, 1905 - - - -	1	0	9
March 21st, 1905 - - - -	1	0	0
April 18th, 1905 - - - -		3	20

Loss in weight on the original weight—11 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck there was a very large pendulous tumour, which measured 7 in. vertically, 6 in. from before backwards, and about 3 in. in greatest thickness, and which weighed with the skin and muscle to which it was attached, 2½ lbs.

On section it was composed of pinkish yellow juicy necrotic tissue, beset with hæmorrhagic foci; in the centre of the tumour there was a cavity 3 in. by 2 in. by 2 in. filled with clear reddish serous fluid, the internal surface of which showed soft shreds and masses of necrotic tissue. The skin was greatly thickened, and was closely beset with congested caseous tubercles; over the centre of the tumour the external layers of the skin were fissured and necrosed. The muscles under the tumour were dense and fibroid, and infiltrated with caseous nodules.

The tissues around the tumour, especially in the dewlap, were œdematous.

Left Prescapular Gland.—Lay in a depression on the posterior surface of the tumour; it was not, however, adherent to it. On section it was composed throughout of very dense yellow caseated tissue, mottled with hæmorrhagic foci; the capsule was greatly thickened.

Prepectoral Glands.—The rounded prepectoral gland on the left side measured 1¼ in. in diameter; on section it resembled the prescapular. A deeper gland, ½ in. in diameter, was similar on section. A third gland (on the first rib) was œdematous, and showed a caseating patch in one part of the cortex.

The right prepectoral glands contained caseating nodules.

Cervical Glands.—On the left side two of the lower cervical glands were enlarged. On section they showed firm grey translucent tissue, beset with whitish foci.

Other cervical glands contained caseating nodules.

Abdomen :—

Omentum.—On the inferior surface of the omentum there was a considerable number of loosely attached lenticular nodules, the largest 6 to 7 millimetres in diameter; the nodules had yellow centres and grey translucent margins. There were also numerous small clusters of grey granules in slightly hypertrophied lymphatic fringes.

Peritoneum.—On the parietal peritoneum, near the spleen, there were two or three flattened nodules similar to those on the omentum.

Spleen.—Weighed 14 ozs. On the convex surface there was a flat lenticular growth; on section the pulp was crowded with yellow caseating nodules, ranging from about 1·5 to 3 millimetres in diameter.

Liver.—On the suspensory ligament there were numerous tubercles, mostly small, but some the size of a wheat grain. The liver was enlarged, pale and soft; the substance showed moderately numerous tubercles, ranging in size from a point just visible to the naked eye to about 2 millimetres in diameter. On the surface many of the tubercles projected under the capsule, some on the convexity being considerably flattened and "mushroomed" (largest 5 millimetres in diameter).

Gall Bladder.—Under the mucous membrane there was a pinhead-sized tubercle.

Portal Glands.—Were enlarged and œdematous. They showed in the cortices nodular masses of grey tissue, studded with whitish foci.

Kidneys.—The left kidney showed in the cortex sparsely scattered grey tubercles, with opaque centres, the largest not exceeding 1·5 millimetres, the smallest just macroscopically visible.

The right kidney showed similar tubercles.

Suprarenal Bodies.—Normal.

Thorax :—

Heart.—Under the pericardium of the right ventricle there was a caseating nodule (10 by 5 millimetres) embedded in the muscle substance. There were a few small tubercles in the midst of congested vegetations on the pericardium covering the great vessels.

Endocardium normal.

Pleura.—Along the margins of the ribs there were numerous clusters of pinhead-sized grey tubercles ; there were also scattered about a few lenticular nodules.

There were similar tubercles and nodules on the pleural surface of the diaphragm, and on the pleura covering the pericardium.

Lungs.—The lungs contained moderately numerous nodules, fairly evenly distributed. They ranged in size from a mere point to that of a small pea, and had yellow centres and translucent margins ; except on the dorsal surfaces of the caudal lobes they caused subpleural projections. The right cephalic and right middle lobes showed large areas of consolidation: in the other lobes there were irregular red patches surrounding single nodules or affecting small lobules.

Thoracic Glands.—In the dorsal mediastinum there was a chain of enlarged glands, weighing together 5½ ozs. ; the long mediastinal gland alone weighed a little over 2 ozs. On section the cortex of each gland was firm, grey, and mottled with yellow streaks and foci of caseation.

The bronchial glands were much enlarged (left weighed about 2 ozs.). On section they resembled the mediastinal.

An infra-tracheal gland was enlarged, and similar on section.

A small œdematous gland near the latter contained two or three caseating nodules.

Tonsils.—Contained each one or two caseating nodules.

Pharynx.—In the corrugated mucous membrane at the vault of the pharynx there were a few small softened nodules.

Trachea.—The mucous membrane of the anterior part showed slightly projecting caseating nodules, the size of wheat grains.

Intestines.—The long Peyer's patch contained a moderate number of soft yellow foci, the size of millet seeds ; a few similar foci were seen in the Peyer's patches in the anterior part, but none in the middle portions.

Large Intestine.—The lymphoid follicles in the first part of the colon were enlarged and had yellow centres.

Mesenteric Glands.—The glands at the extremity of the mesentery were more affected than those in the centre. The latter were not enlarged, and showed discrete nodules, whilst the former were slightly enlarged, and showed in their cortices firm, grey patches, studded with caseous foci.

Gastric Glands, Colic Glands.—Resembled the mesenteric : some contained discrete nodules, others were practically tuberculous throughout.

Various Lymphatic Glands :—

Coeliac Glands.—Were enlarged and indurated ; on section they showed their cortices in a state of early caseation.

Pancreatic.—The glands around the pancreas were similarly affected.

Parotid, Submaxillary, Retropharyngeal, Mastoid, Renal, Lumbar, Ilio-Sacral, Iliac, Precrural, Gluteal, Ischiatic, Ventral Mediastinal, Vertebral, Axillary, Right Prepectoral.—Were all slightly enlarged, and beset with caseating nodules, some four millimetres in diameter, or even larger.

Pudic, Popliteal.—Were also packed with nodules, but the glands on the right side were twice the size, and contained more nodules than those on the left.

Right Prescapular Gland.—Was slightly enlarged and very œdematous ; it contained a moderate number of caseating nodules.

All the hæmo-lymph glands contained caseating nodules, the tissue in some of them being almost completely replaced.

Testicles, Urinary Bladder, Eyes.—Normal.

Microscopical Examination.

Pharynx (corrugated mucous membrane.)—Numerous tubercle bacilli.

Tracheal Nodule.—Moderately numerous tubercle bacilli.

Small Intestine (two smears)	Numerous tubercle bacilli.
Large Intestine - - -	

CALF 244.

Intramuscular—Inoculation of culture derived from the original material of Virus B. IX., through Guinea-Pig 1069.

Date—March 13th, 1905.

Dose—46 milligrammes.

Weight—3 qrs., 2 lbs. [Age—12½ weeks.]

Killed—Dying, April 1st, 1905. 19 days after inoculation.

Clinical History.

The calf was inoculated in the muscles on the left side of the neck on March 13th, 1905.

On March 22nd, 1905, nine days after inoculation, there was a deep-seated ill-defined swelling, measuring about 3 in. by 2 in., the skin over which was freely moveable. The left prescapular gland was little if at all enlarged; a prepectoral gland was the size of a walnut. The calf seemed to be unwell, and was breathing more quickly than normal.

In the next few days the respirations rapidly increased in frequency and there was marked emaciation. On March 27th, 1905, 14 days after inoculation, the calf was found in the morning lying on its side and almost unable to get up; the respirations were very frequent and laboured, all the accessory muscles being brought into action; the calf looked so ill that it was not expected to live through the day; towards evening, however, it improved and was able to get up; very little food was eaten.

The rate of respiration continued to be very frequent and became more laboured and spasmodic; very little food was eaten.

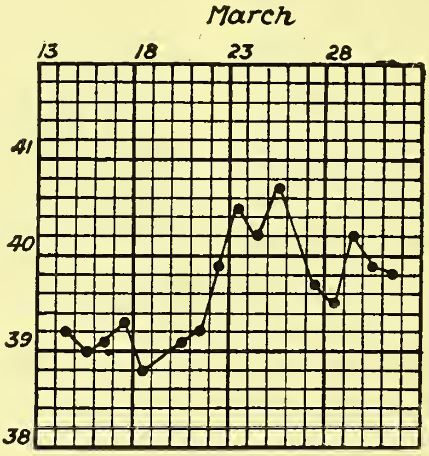
On April 1st, 1905, weakness and emaciation were extreme, and the animal was quite unable to get up; it was therefore killed.

Weights.

	qrs.	lbs.
March 14th, 1905 - - - - -	3	2

The record of the final weight was lost.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Very emaciated.

Local Lesion.—In the muscular tissue on the left side of the neck there was a firm tumour which measured 3 in. by 2 in. by 1¾ in., and weighed about 2 ozs.; on section it was composed of yellow necrotic tissue, and showed in the centre irregular spaces filled with turbid sero-purulent fluid; the skin was adherent chiefly over the central part of the tumour, but was not infiltrated, except along the track of the needle.

Running in the muscles between the local tumour and rounded prepectoral gland there was a thick caseous lymphatic vessel.

Left Prescapular Gland.—Was only slightly enlarged, it measured 2½ in. by 1¼ in. by ¾ in., and weighed about 1 oz. On section part of the cortex was yellow and homogeneous, whilst the rest was composed of grey translucent tissue far advanced in caseation.

Right Prescapular Gland.—Showed a few grey tubercles the size of pins' heads.

Prepectoral Glands.—The spherical prepectoral gland on the left side was a little over 1 centimetre in diameter, and was caseous throughout; it was surrounded by a zone of fibroid caseating tissue, which was continuous with the thickened lymphatic vessel.

A deeper gland was not obviously tuberculous.

The prepectoral glands on the right side appeared normal.

Cervical Glands.—The left superior cervical gland (near the mastoid process) was enlarged to the size of a thrush's egg, and was on section firm, yellow and caseous throughout.

A gland external to the latter showed half its substance composed of firm grey tissue in a state of early caseation, and in the rest of the gland minute greyish white foci.

Other cervical glands on the left side were slightly enlarged and œdematous, but no opaque foci could be seen.

The cervical glands on the right side showed a few barely visible greyish foci.

Abdomen :—

Omentum.—On the inferior surface of the omentum there were a few sparsely scattered tubercles, the largest the size of a mustard seed.

Spleen.—Appeared a little enlarged (weight 5 ozs.). On section the pulp was crowded with small tubercles, which gave the cut surfaces a coarsely granular appearance.

Liver.—Not enlarged. Showed on the surface a purplish mottling; the substance was closely beset with minute grey tubercles.

Gall Bladder.—There were numerous minute tubercles under the mucous membrane.

Portal Glands.—Were enlarged and very œdematous; the cortices showed grey patches and foci, but no sign of caseation.

Kidneys.—The left kidney showed on the surface, as well as in the depth of the cortex, numerous small grey tubercles. The pelvis of the kidney had a peculiar gelatinous appearance.

The right kidney showed tubercles similar to those in the left.

Suprarenal Bodies.—Each suprarenal body presented a few minute grey tubercles in the cortex.

Thorax :—

Heart.—Pericardium normal. On the endocardium of the right ventricle there were a few minute pearly tubercles; one was situated on a chorda tendinea.

Pleura.—Parietal pleura was normal.
There was one small pinhead-sized tubercle on the caval fold of pleura.

Lungs.—The lungs were very congested, and packed with little tubercles similar to those in the liver. The small anterior lobes on the right side showed large areas of consolidation; in the other lobes there was an occasional consolidated lobule.

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged, firm, and greyish yellow on the surface: on section the cortex was in a state of early caseation, a fine yellow network permeating a greyish translucent tissue.

Other glands in the dorsal mediastinum, and the bronchial glands, were enlarged and in a similar condition.

The infra-tracheal glands were similar, but not quite so advanced.

Larynx, Trachea, Bronchi.—Normal.

Tonsils.—Showed a few minute greyish-white points, and there were a few opaque foci in the pharyngeal mucous membrane.

Pharynx.—In the corrugated mucous membrane in the vault of the pharynx there were numerous small opaque tubercles.

Intestines.—In the long Peyer's patch there were some very minute greyish white pin-point foci under the mucous membrane; none were visible in any other part of the ntestine.

Submaxillary Glands, Pharyngeal Glands, Parotid Glands, Precrural Glands, Pudic Glands, Popliteal Glands, Gluteal Glands, Ischiatic Glands, Iliac Glands, Gastric Glands, Mesenteric Glands, Colic Glands.—Contained numerous minute tubercles, which were just macroscopically visible.

Axillary Glands, Ventral Mediastinal Glands.—Showed on the surface, under the capsule, minute specks, which on section could not be with certainty differentiated from the surrounding gland tissue.

Cœliac Glands.—Were slightly enlarged. The cortices were firmer and greyer than normal, and showed here and there some extremely minute whitish foci.

Lumbar Glands, Renal Glands.—Resembled the cœliac.

Several hæmo-lymph glands showed small tubercles.

Bladder, Eyes, Testicles.—Normal.

Microscopical Examination.

Tonsil.—A few tubercle bacilli.

Pharynx, (Tubercle in Corrugated Mucous Membrane of Vault of Pharynx): Numerous tubercle bacilli.

Small Intestine: (1) Tubercle: (2) Scraping from mucous membrane.—No tubercle bacilli seen in either.

Precrural Gland.—Numerous tubercle bacilli.

Haemo-lymph Gland }
Portal Gland - - } Very numerous tubercle bacilli.

Marrow.—No tubercle bacilli.

Suprarenal Body.—Numerous tubercle bacilli.

COMMENT ON CALF 244.

In this case the inoculation of the culture into the muscles was followed by a more acute tuberculosis than in the fellow calf inoculated purely subcutaneously.

This may be due to the fact that muscles are more vascular and less capable of resisting the invasion of tubercle bacilli than the subcutaneous tissues. (*See also* Calf 250.)

CALF 320.

Subcutaneous—Inoculation of culture derived from the original material of Virus B IX.

Date—September 11th, 1905.

Dose—10 milligrammes.

Weight—2 qrs., 17 lbs. [Age—8 weeks.]

Died—October 18th, 1905. 37 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 11th, 1905.

Eleven days later there was a prominent firm tumour 3½ in. by 3 in.; the left prescapular gland measured 3 in. in length, and a prepectoral gland was much enlarged, being about the size of a pigeon's egg.

Both the tumour and the gland gradually increased in size; on October 10th, 1905, 29 days after inoculation, the former measured about 6 in. by 4 in. in superficial area and was very prominent; the prescapular gland measured 5 in. in length and the prepectoral gland was about the size of a bagatelle ball; there was marked œdema of the tissue of the neck at the inferior extremity of the tumour, and of the dewlap. On this date (October 10th) the calf was first noticed to be ill; the coat was rough, there appeared to be some loss in flesh, the respirations were visibly increased and there was occasional cough. The calf rapidly became worse; the respirations increased in frequency and gradually became more and more laboured, all the accessory muscles of respiration being brought into action. It died on October 18th, 1905, 37 days after inoculation.

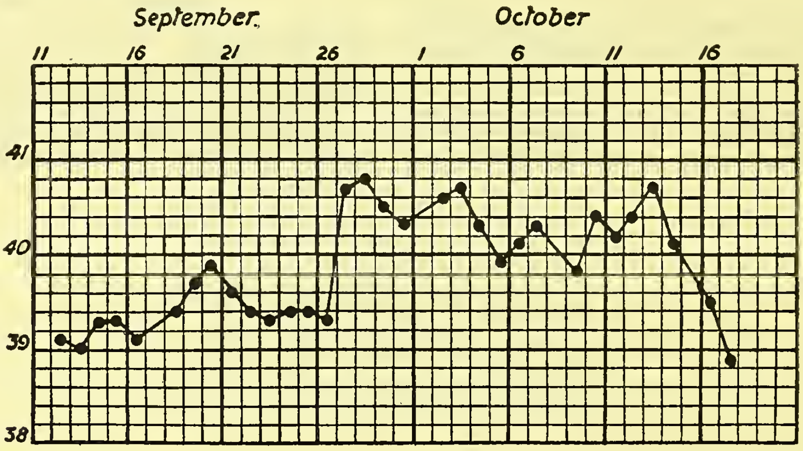
Weights.

From September 12th, 1905, to October 5th, 1905, there was a gain in weight of 4 lbs.; during the last 13 days the calf lost 9 lbs.

	qrs.	lbs.
September 12th, 1905 - - - -	2	17
October, 5th, 1905 - - - - -	2	21
October 18th, 1905 - - - -	2	12

Lost in weight on the original weight: 5 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Seat of Inoculation.—The local tumour measured 5 in. by 4½ in. by 2 in., and weighed with the skin and infiltrated muscles 1 lb.

On section there was the usual dense caseo-necrotic tissue in the subcutaneous tissues, showing in the centre a series of small irregular spaces filled with reddish serous fluid. Under the upper part of the tumour the caseo-necrotic tissue extended for a good distance into the muscles, which elsewhere were fibroid and closely beset with caseous nodules. The skin was thickened, congested, and studded with yellow caseous tubercles throughout its whole thickness.

Left Prescapular Gland.— Weighed 6 ounces and measured 3¾ in. by 2 in. by 2 in. On section it was composed throughout of dense yellow caseating tissue.

In the loose tissues around the lower part of the tumour and prescapular gland there was a moderate amount of œdema fluid.

Running in the muscles between the local tumour and the rounded prepectoral gland there was a firm caseous cord the thickness of a little finger; the muscles around it were infiltrated with caseous tubercles.

Prepectoral Glands.—On the left side the spherical prepectoral gland, the size of a walnut, was dense yellow and caseous throughout, and was embedded in a mass of fibroid muscular tissue, closely beset with yellow caseous nodules; these nodules were arranged in lines which ran parallel to the muscle fibres.

The reniformgland measured 1½ inches in length, and showed the greater part of its cortex composed of firm grey translucent tissue in a state of early caseation; the rest of the gland was very œdematous. A pea-sized gland, posterior to the latter, contained a group of three or four small caseating tubercles.

Just within the entrance to the thorax there was a gland 1¼ inches in length, the cortex of which showed moderately well advanced caseation.

Of the prepectoral glands on the right side, one was enlarged, and showed part of its cortex firm and caseating; the others contained discrete tubercles.

Cervical Glands.—Along the left side of the trachea there was a chain of four slightly enlarged œdematous glands, each of which showed part of the cortex firm and in a state of early caseation. The left superior cervical gland was smilarly affected.

The right cervical glands contained discrete caseous tubercles, irregular in outline.

Abdomen :—

Omentum.—On the inferior surface of the omentum there were about twelve flattened nodules, yellow and opaque in the centre, the largest the size of a wheat grain; the lymphatic fringes were congested and slightly hypertrophied.

Spleen.—Weighed 9½ ozs. The pulp contained fairly numerous, firm, yellow caseous nodules, ranging from 1 to a little over 2 millimetres in diameter, with congested margins.

Liver.—Contained moderately numerous evenly distributed opaque greyish-white tubercles mostly about 1 millimetre in diameter; a few were raised above the surface, and on the anterior surface were flattened.

Gall Bladder.—Showed one pinhead-sized tubercle under the mucous membrane.

Portal Glands.—Were enlarged, œdematous, and showed in the cortex caseating tubercles closely aggregated together.

Kidneys.—Were pale, and showed in the cortex, on the surface as well as on section, numerous tubercles, ranging in size from a mere point up to a little over 1 millimetre in diameter: the larger tubercles had opaque caseous centres, in some cases yellow.

Suprarenal Bodies.—Normal.

Thorax :—

Heart.—Muscle and valves normal.

Pericardium.—On the internal surface of the parietal pericardium there was a small pinhead-sized tubercle.

Pleura.—The lymphatic fringes along the margins of the ribs were congested in patches, and contained small grey tubercles.

The pleura covering the pericardium showed patches of congested villi, at the base of which a few small tubercles were seen.

Lungs.—The cephalic and right middle lobes were dark red and almost completely hepatised; the antero-ventral portions of the caudal lobes were also more or less solid, whilst in the rest of these lobes there were diffuse patches of early consolidation.

The substance of the lung was closely beset with miliary tubercles with grey margins and caseous centres; they were evenly distributed, somewhat irregular in outline, and remained more or less discrete; some of the sub-pleural tubercles were flattened out. The bronchi in the solid portions were filled with yellow muco-pus.

Mediastinal Glands.—The long mediastinal gland was moderately enlarged, and showed on section in the cortex firm grey tissue in a very early stage of caseation; the medulla was œdematous and deeply congested.

The other dorsal mediastinal glands and the bronchial and infratracheal glands were similarly affected, but in the bronchial glands caseation was more definite as a fine network.

Tongue, Pharynx, Larynx.—Normal.

Tonsils.—Each tonsil contained one or two caseous miliary tubercles.

Alimentary Tract:

Trachea.—The mucous membrane of the trachea showed scattered elongated raised ulcerated caseous foci, congested around the margins.

Small Intestine.—The long Peyer's patch showed scattered pinhead-sized caseous tubercles; in the rest of the intestine they were very sparsely distributed, only one or two being found here and there.

Large Intestine.—Normal.

Gastric Glands, Colic Glands.—Contained discrete caseating tubercles.

Mesenteric Glands, Ileo-Colic Glands.—Were not enlarged; they showed in the cortices discrete caseous tubercles and caseous foci, the latter often grouped together in a nodule of translucent grey tissue.

Other Lymphatic Glands :—

Cœliac Glands.—One enlarged cœliac gland showed the cortex grey and translucent, and speckled with early caseous foci; other cœliac glands contained discrete irregular yellow caseous foci.

Renal Gland.—Resembled the enlarged cœliac.

Lumbar, Iliac, Precrural, Popliteal, Gluteal, Ischiatic.—Contained a varying number of irregular yellow caseous tubercles, ranging up to 2 millimetres in diameter; in no gland were they very numerous.

Pudic, Ventral Mediastinal, Mastoid, Parotid, Submaxillary, Axillary, Right Prescapular.—Contained a varying number of irregular yellow caseous tubercles, ranging up to 2 millimetres in diameter; in no gland were they very numerous.

Many hæmolymph glands contained opaque miliary tubercles.

Mammary Gland, Eyes.—Normal.

CALF 324.

Subcutaneous—Inoculation of culture derived from the original material of Virus B IX.

Date—September 11th, 1905.

Dose—10 milligrammes.

Weight—2 qrs., 24 lbs. [Age—8 weeks.]

Died—October 15th, 1905. 34 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on September 11th, 1905.

Eleven days later there was a firm infiltrating tumour measuring 3½ in. by 2 in.; the left prescapular gland was nearly 3 in. in length.

On September 30th, 1905, the tumour attained its maximum, 4 in by 3 in.; the prescapular gland measured 3 in. in length, and subsequently showed a slight further increase in size.

On October 10th, 1905, the calf was obviously ill, the coat was rough, the respirations were increased (rate 60 to 64 per minute), expiration ending in a short grunt. The illness rapidly became more acute, and the calf died on October 15th, 1905, 34 days after inoculation.

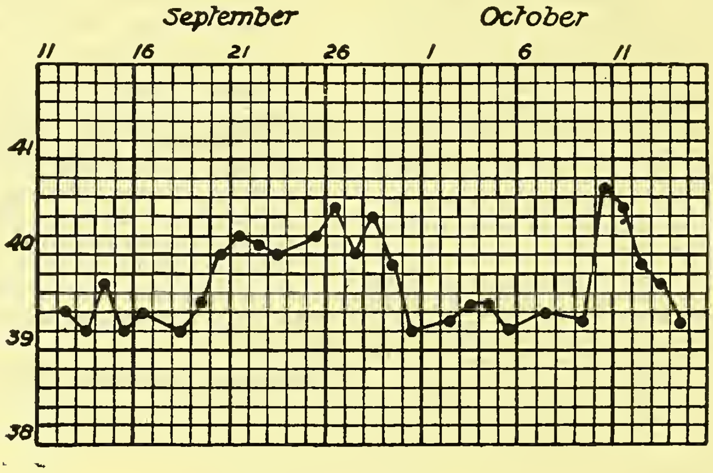
Weights.

There was a slight increase in weight during the first week and then a steady decline.

	qrs.	lbs.
September 12th, 1905 - - - -	2	24
September 19th, 1905 - - - -	3	6
October 15th, 1905 - - - -	2	17

Loss in weight on the original weight—7 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—The local tumour measured roughly 4 in. by 2¾ in. by a little over 1 in. On section it consisted of dense congested yellow caseo-necrotic tissue, situated partly in the subcutaneous tissues and partly (the greater part) in the muscular. In the subcutaneous portion there was a small cavity, with ragged walls, containing serous fluid; the skin was adherent, but not infiltrated.

A thickened lymphatic vessel extended from the local tumour for a short distance towards the prescapular gland.

Left Prescapular Gland.—Measured 3 in. by 2 in. by 1¼ in., and weighed 3½ ozs. The greater part of the cortex was composed of the usual dense caseated tissue; a small portion of the cortex near the hilum showed discrete llow tubercles.

Right Prescapular Gland.—In the right prescapular gland tubercles were moderately numerous.

Left Prepectoral Glands.—The rounded prepectoral, the size of a pea, showed part of the cortex caseous, the rest of the substance congested and œdematous.

The kidney-shaped prepectoral gland contained a caseating mass replacing about one-third of the substance.

Just within the entrance of the thorax, on the left side, there was a large gland the size of a pullet's egg, composed of greyish red tissue, mottled with yellow caseous patches.

Right Prepectoral Glands.—The right prepectoral glands contained a few small caseous tubercles.

Cervical Glands.—The cervical glands on both sides showed small caseous tubercles, irregular in outline.

Abdomen:—

Peritoneum.—There was a small amount of serous fluid in the peritoneal cavity.

Omentum.—No tubercles seen.

Spleen.—Not enlarged (weight 4 ozs.). Showed on section a moderate number of spherical yellow caseous miliary tubercles.

Liver.—Normal in general appearance. Contained fairly numerous minute grey tubercles with opaque white centres; there were also a few larger tubercles up to 1 millimetre in diameter, with yellow centres.

Gall Bladder.—There was one small yellow tubercle under the mucous membrane.

Portal Glands.—Were slightly enlarged and œdematous, and showed in the cortex irregular caseating tubercles, in places closely aggregated.

Kidneys.—Right kidney showed on the surface sparsely scattered tubercles (twelve to fifteen), the largest about 1 millimetre in diameter, with caseous centres and grey margins.

In the left kidney similar tubercles were seen in smaller number.

Suprarenals.—The left suprarenal body contained in the cortical zone a yellow caseous tubercle, the size of a pin's head.

Right suprarenal normal.

Thorax:—

Heart.—Cavities filled with dark red blood clot; muscle substance, pericardium and endocardium normal.

Pleura.—There was a small amount of serous fluid in the pleural cavities.

The parietal pleura showed along the margins of some of the ribs a few congested and slightly hypertrophied lymphatic fringes containing minute grey granules.

Diaphragm.—Normal.

Lungs.—The lungs were heavy. The cephalic lobes were firm, pinkish red, and almost completely consolidated ; the right middle lobe was quite solid, and sank in water. The antero-ventral portions of the caudal lobes were solid, small pieces sinking in water ; the rest of the caudal lobes showed diffuse greyish red areas and several large solid lobules, dark red in colour from recent hæmorrhage. The lung tissue was closely beset with miliary caseous tubercles, irregular in outline, which appeared to be more numerous in the solid than in the crepitant portions ; in the former they showed a tendency to become confluent.

Mediastinal Glands.—Were moderately enlarged, and showed the greater part of the cortex composed of greyish red translucent tissue, with an irregular caseous network ; the medullæ were congested and œdematous.

Bronchial Glands, Infratracheal Glands.—Were similarly, but a little more severely, affected.

The ventral mediastinal glands showed a few minute caseous tubercles.

Tongue, Pharynx, Larynx, Trachea.—Normal.

The trachea was filled with froth.

Tonsils.—Normal.

Small Intestines.—There were a few minute caseous tubercles in the Peyer's patches, chiefly in the ileum ; large patches of mucous membrane were hæmorrhagic.

Large Intestine.—Normal.

Mesenteric Glands.—Contained scattered irregular caseous tubercles.

Gastric Glands, Colic Glands.—Majority normal ; a few showed caseous foci.

Various Lymphatic Glands :—

Cœliac Glands.—One cœliac gland showed part of its substance composed of grey tissue, containing early foci of caseation ; the others contained a few minute caseous foci.

Renal.—The renal gland contained fairly numerous irregular caseating tubercles, up to 1·5 millimetre in diameter.

Lumbar.—Showed grey tubercles, with caseous centres, aggregated into groups.

Sacro-Iliac, Iliac, Precrural, Popliteal, Gluteal Ischiatic, Pudic, Submaxillary, Parotid, Retropharyngeal.—Contained irregular caseous tubercles in small number, which varied in size up to about 1 millimetre in diameter.

Several hæmolymph glands contained small caseous tubercles.

Testicles, Eyes.—Normal.

PIG 138.

Subcutaneous—Inoculation of culture derived from the original material of Virus B. IX., through Guinea-Pig 1039.

Date—March 29th, 1906.

Dose—1·0 milligramme.

Weight—1 qr. 11 lbs. [Age 13 weeks.]

Killed—When ill, June 29, 1906. 92 days after inoculation.

Weights.

	qr.	lbs.
March 30th, 1906 - - - - -	1	11
April 24th and May 15th, 1906 -	1	21
June 29th, 1906 - - - - -	1	20

Gain in weight—9 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous fatty tissues near the umbilicus there was a firm flattened tumour, measuring 1½ in. by 1½ in. by ½ in.; the skin over it was not adherent but showed near one margin a small opening, probably corresponding to the site of entry of the injection needle, covered over by a dry scab; the opening was the termination of a short canal, filled with soft caseous material, which extended obliquely to the margin of the tumour. The tumour on section was composed of a mass of tough yellowish white caseated tissue, slightly gritty around the margins and beginning to break down in the centre.

Around the periphery of the tumour there was a number of discrete yellow gritty pin head sized tubercles.

Superficial Inguinal Glands.—On the right side one of the most anterior glands of the group, ¾ in. in length, was hard, caseo-necrotic throughout and at one part beginning to soften; the caseous mass could be readily shelled from the capsule surrounding it and when removed showed a yellow and mulberry-like surface; internally the mass had a pinkish somewhat translucent appearance and was penetrated by a fine opaque whitish network, in places perceptibly gritty; from the margin of this gland a short thick caseous cord extended in an anterior direction. Another gland, the same size as the latter, was partly caseous. A third gland was penetrated by an irregular coarse yellow network, whilst all the others, little if at all enlarged, contained small irregular yellow patches of caseation.

On the left side two glands, each an inch long, were caseous practically throughout, resembling in structure the caseous gland on the right side; a number of smaller glands showed on section small irregular patches and foci of caseation.

Precrural Glands.—The right precrural gland showed in the cortex three or four irregular caseous nodules, up to 2·5 mm. in diameter.

In the position of the left precrural gland there was a group of small separate glands each of which contained yellow caseous nodules similar to those in the right precrural gland; all these nodules were just perceptibly gritty.

Iliac Glands.—On the right side one gland, 1¼ in. in greatest diameter, was indurated and extensively caseated; two smaller glands were caseous throughout; two others contained small yellow caseous patches; the caseous areas in all these glands showed slight calcification. On the left side there was a group of six slightly enlarged glands which showed on section irregular coarse yellow streaks of caseation.

The Lumbar Glands on each side were slightly enlarged and showed irregular yellow caseous patches containing early foci of calcification.

Thorax.

There was no fluid in the pleural cavities.

Lungs.—The ventral portions of the left lung were slightly adherent to the chest wall; the rest of the lung was free from adhesions.

The lobes of the lungs on each side were closely united together.

The cephalic, right middle and antero-ventral portions of the caudal lobes were firm and quite solid; the small anterior lobes, and the thin ventral parts of the caudal were very irregular and nodular on the surface; on section the consolidated parts were found to be divided into lobules by trabeculæ of fibrous tissue; the majority of these lobules were composed throughout of firm translucent tissue beset with irregular yellow foci of various sizes, some softened; many of the lobules contained irregular cavities filled with very tenacious caseo-pus, whilst in others all the solid tissue was completely converted into caseo-pus.

The posterior parts (slightly more than half) of the caudal lobes were crepitant and beset with evenly distributed shotty caseous tubercles ranging in size from a millet seed to a hemp seed; the tubercles were slightly gritty from calcification and had thin fibrous capsules from which the caseous material could be readily shelled; there were besides a few larger grey translucent nodules containing caseous points. The fringes around the margins of the caudal lobes were slightly hypertrophied and contained a few small hard tubercles.

The Bronchial Glands were much enlarged. The glands on the left side were dense yellow and caseous practically throughout. On the right side the gland in front of the bronchus to the cephalic lobe was irregularly caseated; the one anterior to the main bronchus was caseous almost throughout; all these glands were slightly gritty from calcification.

An intertracheo-bronchial gland contained discrete soft yellow caseous nodules, up to a hemp seed in size.

Two small Dorsal Mediastinal Glands contained caseous nodules.

Pleura.—There was slight hypertrophy of the connective tissue fringes along the margins of some of the ribs and around the margins of the tendon of the diaphragm; here and there a small hard tubercle could be felt.

Heart and Pericardium.—Normal.

The Sternal Glands were enlarged and adherent together. On section they were composed throughout of firm caseated tissue, slightly gritty from calcification; the capsules were slightly thickened.

Abdomen.

Omentum.—Normal.

The Peritoneum covering the diaphragm on the right side, showed a number of small slightly raised semi-transparent nodules; on the left side of the diaphragm the peritoneum was slightly roughened.

Spleen—Not apparently enlarged, showed on the surface moderately numerous yellow projecting nodules ranging in size from a millet-seed to a hemp seed; on the surface of the capsule about the hilum there were numerous minute transparent granules, some congested. On section caseous nodules were evenly distributed throughout the pulp; the nodules were friable, slightly gritty from calcification and were surrounded by delicate fibrous capsules.

A gland in the gastro-splenic omentum contained a few caseous points.

Liver.—The capsule on the anterior surface, particularly of the left lobe, showed numerous long delicate strands of connective tissue; evenly distributed throughout the substance were numerous caseous tubercles. similar to those in the spleen, the largest the size of a millet seed.

Portal Glands.—In the small omentum there was a group of enlarged glands, the size of a hen's egg, which on section were composed practically throughout of firm yellowish slightly gritty caseated tissue.

Cœliac Glands.—One, 1½ in. in length, showed the substance extensively replaced by yellow caseous coalescing nodules, containing in the centre opaque whitish foci of calcification; another gland, the size of a kidney bean, contained discrete caseous nodules (3 mm.) in the cortex; several small glands showed small patches of caseation.

The Left Kidney showed one minute tubercle with an opaque yellow centre.

The Right Kidney and Suprarenal Bodies were normal.

Tonsils, Tongue and Pharynx.—Normal.

Larynx.—The vocal chords were in close opposition and it was only with difficulty that the tip of the finger could be inserted into the glottis—on account of great rigidity of the thyroid cartilages; respiration had apparently been carried on solely through a narrow aperture between the arytenoid cartilages, (during life the pig was unable to squeal and became breathless and cyanosed on exertion.)

The Trachea was very small.

The Mucous Membrane of the Larynx and Trachea was normal.

The Pharyngeal Glands were enlarged and showed on section irregular patches and coarse streaks of yellow caseation.

The Superior and Mid Cervical Glands and one Lower Cervical Gland showed an earlier stage of caseation.

The Right Prescapular Gland showed three soft caseous nodules. The left was normal.

Stomach and Intestines.—Normal.

The Mesenteric and Ileo-colic Glands were not apparently enlarged; all contained yellow friable caseous nodules, some in good number, ranging in size up to that of a hemp seed; one of the glands in the anterior part of the mesentery was partly caseous.

Colic Glands.—Several contained irregular caseous nodules.

The Thymus Gland was very large; it showed on section three firm caseous gritty nodules, the smallest the size of a millet seed, the largest that of a large pea.

Microscopical Examination.

A few tubercle bacilli were found in a smear made from a nodule in the thymus gland.

VIRUS B X.

June 23, 1904.

MESENTERIC GLANDS.

The specimens were obtained from a calf which before being killed appeared healthy and well nourished. The autopsy revealed tuberculosis of the peritoneum, particularly on the diaphragm, of the pleura, of the lungs and spleen (only slight), and of all the lymphatic glands. The mesenteric glands from which the culture used for experiment was derived, were not obviously enlarged, but contained yellow calcareous nodules.

VIRUS B X.

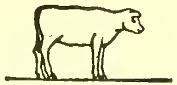
(June 23rd, 1904.)

MESENTERIC GLAND.

Culture Inoculations.

Inoculated on April 19th, 1905, with Culture derived from the original material through Guinea-pig 1070.

The Culture used was the 13th generation, 20 days old, and had been in cultivation for a total period of 295 days.

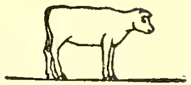


CALF 260.

Subcutaneous.
Dose : 50 mg.
Died May 24th, 1905 (35 days).
P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
267	1·0 mg.	Intravenous	D. 10 days	G.T.
266	0·1 mg.	Intravenous	D. 16 days	G.T.
270	1·0 mg.	Intraperitoneal	D. 17 days	G.T.
272	1·0 mg.	Intraperitoneal	D. 38 days	G.T.
268	0·1 mg.	Intraperitoneal	D. 20 days	G.T.
269	1·0 mg.	Subcutaneous	D. 97 days	G.T.
271	1·0 mg.	Subcutaneous	D. 64 days	G.T.



CALF 262.

Subcutaneous.
Dose : 25 mg.
Killed, very ill, June 1st, 1905 (43 days).
P.M.—General tuberculosis.

CALF 260.

Subcutaneous Inoculation of culture derived from the original material of Virus B X. through Guinea-pig 1070.

Date—April 19th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 16 lbs. [Age—11 weeks.]

Died—May 24th, 1905. 35 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of neck on April 19th, 1905. Thirteen days later there was a slightly-raised, firm, pear-shaped tumour, measuring 6 in. from above downwards, and 4 in. in greatest breadth; the left prescapular gland was 4 in. in length, and a prepectoral gland was about the size of a walnut. There was slight œdema of the dewlap.

On May 10th, 1905, three weeks after inoculation, the tumour was thicker but had not increased in area; the prescapular gland measured 4½ in. in length; the general condition of the animal was fair.

On May 19th, 1905, the calf had become obviously ill; the rate of respiration was much increased (70 per minute), there was occasional cough, and the animal appeared to be losing flesh.

The respiration continued very frequent, and became more and more embarrassed; all the accessory muscles of respiration were brought into action, expiration ending in a short grunt. Very little food was eaten on account of the rapid breathing, and the calf became appreciably thinner; during the last 2 or 3 days there was marked weakness. The calf died on May 24th, 1905, 35 days after inoculation.

Weights.

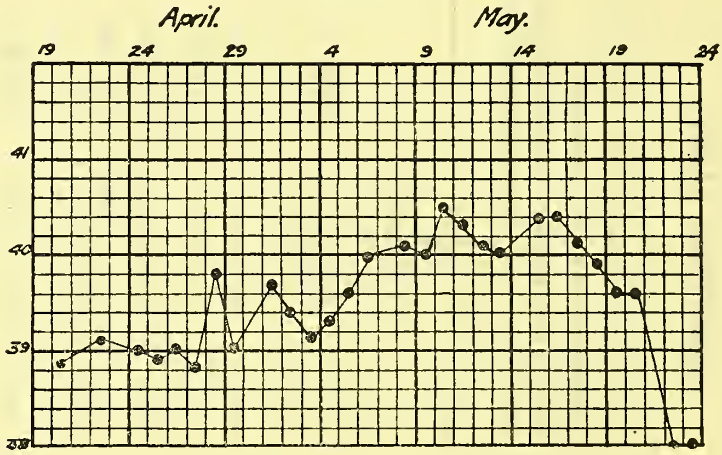
There was a steady decline in weight:—

	qrs.	lbs.
April 20th, 1905 - - - - -	3	16
May 10th, 1905 - - - - -	3	9
May 18th, 1905 - - - - -	2	25
May 24th, 1905 - - - - -	2	21

Loss in weight.—23 lbs.

Average loss per week.—4·6 lbs.

Temperature.



POST-MORTEM EXAMINAITON.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck there was a firm tumour, measuring 6 in. by 3½ in. by 1½ in. The lower extremity extended into the tissues of the neck, gradually tapering. On section, it showed between the skin and muscles caseo-necrotic tissue of the usual type, one inch in greatest thickness. In the upper part of this tissue there was a series of irregular communicating spaces filled with serous fluid. The skin was adherent, and infiltrated, mainly in its deeper layers; the muscles attached to the tumour were œdematous, and studded with caseous tubercles.

Left Prescapular Gland—Measured 3¾ in. by 2 in. by 1½ in On section, the cortex consisted throughout of dense, opaque, pinkish yellow caseated tissue.

Right Prescapular Gland.—Contained numerous discrete caseating tubercles.

Left Prepectoral Glands.—The spherical gland measured 2 centimetres in diameter, and consisted throughout of very dense yellow caseous tissue. The kidney-shaped gland was slightly enlarged, œdematous, and contained about half a dozen caseous tubercles; a small gland near the latter appeared normal.

Cervical Glands.—A left upper cervical gland, the size of a filbert, was indurated, yellow, and caseating throughout (change not so advanced as in prescapular). A small gland under the left scalenus was œdematous and closely beset with caseous foci. Other cervical glands on the left side and the right cervical glands contained discrete caseating tubercles.

Abdomen :

Omentum.—On the inferior surface there were fairly numerous loosely attached lenticular nodules up to 2 millimetres across; some of the nodules were deeply hæmorrhagic.

Parietal Peritoneum.—Normal.

Spleen.—Enlarged and firm (weight 16 ozs.) packed with yellow caseating nodules ranging up to about 1·5 millimetre in diameter.

Liver.—Was slightly enlarged, soft, and showed pale areas of parenchymatous degeneration; the substance was crowded with small grey tubercles with opaque centres, ranging in size from a mere point to that of a pin's head; the surface of the liver felt slightly granular.

Gall Bladder.—Was distended with bile, and showed under the mucous membrane a few caseous tubercles, some of which appeared to have ulcerated.

Portal Glands.—Were enlarged, œdematous, and contained in the cortices confluent grey masses in a state of early caseation.

Kidneys.—The left kidney showed in the cortex fairly numerous grey tubercles, the largest the size of a millet seed; all were opaque yellow in the centre.

In the right kidney there were similar tubercles.

Suprarenals.—The left suprarenal body had one small grey tubercle in the cortex. The right suprarenal appeared normal.

Thorax :

The tissues in the dorsal mediastinum were œdematous.

Pleura.—Along the margins of the ribs there were a few minute grey tubercles surrounded by deeply congested connective tissue.

Diaphragm.—Normal.

Heart.—In the fatty tissue at the base of the left ventricle there was a shotty tubercle. Heart muscle, pericardium, and endocardium normal.

Lungs.—The cephalic lobes, right middle lobe, and antero-ventral portions of the caudal lobes were extensively consolidated (red hepatisation); the dorsal borders remained crepitant. The posterior and dorsal parts of the caudal lobes were congested, and showed patches of more recent consolidation; the bronchi in the solid lobes were filled with yellowish muco-pus; those in the caudal lobes exuded frothy œdema fluid, or in some cases muco-pus. The tissue of the lungs was closely and evenly beset with grey caseating tubercles, the largest about 1 millimetre in diameter.

Mediastinal Glands.—The dorsal mediastinal glands were moderately enlarged (together weighed 2½ ozs.). On section the cortices were composed of firm grey tissue, surrounding irregular streaks and foci of caseation; the medullary portions of the glands were congested and œdematous.

The bronchial, peribronchial, and one of the infra-tracheal glands were enlarged and in a similar condition. Two small infra-tracheal glands contained numerous discrete caseating tubercles.

The ventral mediastinal glands and two small glands in a fold of pleura near the apex of the heart also contained numerous tubercles.

Trachea.—The mucous membrane showed numerous small, slightly raised, ulcerated foci, congested around the margins; from the centre of each focus a little softened material could be scraped.

Pharynx.—In the mucous membrane in the vault of the pharynx, and in that of the upper surface of the soft palate, there were a few small tubercles.

Tonsils.—Contained a number of miliary caseating tubercles.

Intestines.—The small intestine showed fairly numerous pin-head-sized caseous tubercles, occurring chiefly in Peyer's patches, and most numerous in the ileum.

The mucous membrane in the upper part of the colon showed numerous grey elevated bodies, the size of pins' heads (no tubercle bacilli found; possibly normal or slightly enlarged follicles).

Gastric Glands, Mesenteric Glands, Colic Glands.—Contained numerous discrete caseous tubercles; the glands in the posterior part of the mesentery being the most severely affected.

Bladder.—There was a minute congested yellow tubercle under the mucous membrane.

Eyes, Testicles.—Normal.

Various Lymphatic Glands :

Cœliac.—Were slightly enlarged; the cortex of one was firm and grey, and studded with yellow foci; in the others there were numerous discrete caseous tubercles.

Ischiatic, Gluteal, Popliteal, Precrural, Pudic, Iliac, Ilio-Sacral, Axillary, Right Prepectoral, Submaxillary, Parotid, Retropharyngeal.—Contained numerous discrete caseating tubercles, ranging in size up to 1·5 millimetres (or occasionally 2 millimetres) in diameter.

Renal, Lumbar.—Were crowded with confluent grey caseating tubercles.

All the hæmo-lymph glands were packed with caseating tubercles.

Microscopical Examination.

$\left.\begin{array}{l}\textit{Trachea}\\ \textit{Bladder}\end{array}\right\}$ Moderately numerous tubercle bacilli.

Gall Bladder.—Numerous tubercle bacilli.

Heart.—Two tubercle bacilli.

Large Intestines (follicles).—No tubercle bacilli.

CALF 262.

Subcutaneous Inoculation of culture derived from the original material of Virus B X. through Guinea-pig 1070.

Date—April 19th, 1905.

Dose—50 milligrammes.

Weight—1 cwt. 1 qr. 6 lbs. [Age—11 weeks.]

Killed—Very ill. June 1st, 1905. 43 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 19th, 1905.

Thirteen days after inoculation there was a prominent rounded tumour measuring 5 in. by 3½ in. in superficial area; the left prescapular gland was 5 in. in length and a prepectoral gland was slightly enlarged.

On May 10th, 1905, the tumour was a little larger and the skin over the upper part showed a minute opening discharging clear serous fluid; there was slight œdema of the dewlap; the prescapular gland was about 6 in. in length.

On this date, three weeks after inoculation, signs of illness were first noticed; the coat was rough, there was slight increase in respiration, and the calf appeared to be losing flesh.

On May 19th, 1905, 30 days after inoculation, the tumour measured 6½ in. by 4 in., and was prominent and firm; the skin showed a small ulcer with a caseous floor; the prescapular gland was very large; a prepectoral gland was the size of a marble; the general condition of the calf was about the same as on May 10th.

On May 25th, 1905, the respiration was more frequent and had become somewhat laboured, expiration ending in a short grunt.

The calf gradually got worse and became progressively thinner and weaker.

It was killed when very ill on June 1st, 1905, 43 days after inoculation.

Weight.

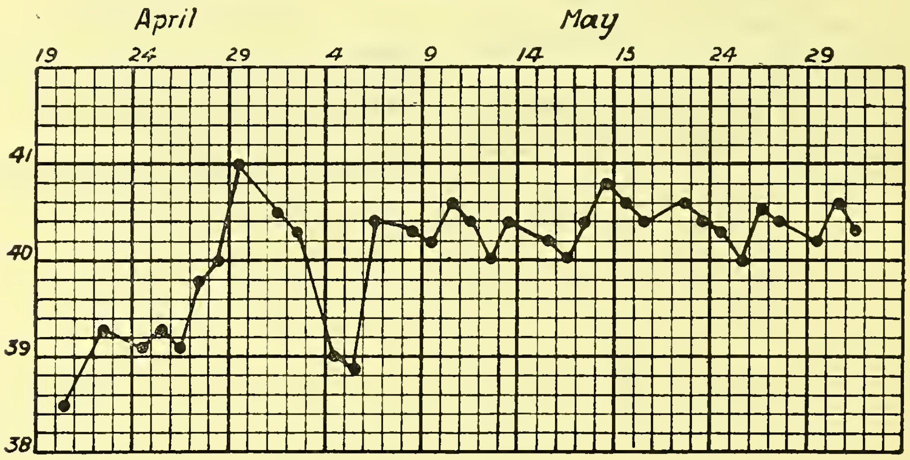
There was a steady decline in weight.

	cwt.	qrs.	lbs.
April 20th, 1905 - - - -	1	1	6
May 2nd, 1905 - - - -	1	0	23
May 10th, 1905 - - - -	1	0	19
May 23rd, 1905 - - - -	1	0	12
May 30th and June 1st, 1905 - -	1	0	0

Loss in weight.—1 qr. 6 lbs.]

Rate of loss per week.—5·67 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck there was a tumour measuring 6 in. by 4 in. by 2 in. On section the superficial part of the tumour (*i.e.* that just under the skin), about an inch in greatest thickness, was composed of yellow caseo-necrotic tissue, containing in the upper part an irregular flattened cavity or space, crossed by soft fibrous trabeculæ. The cavity communicated externally, and contained a small amount of offensive turbid fluid. The deeper part of the tumour consisted of dense fibroid (muscular) tissue, closely studded with caseous nodules. The skin, external to the cavity, was infiltrated with caseous deposit, fissured and necrosed, and was easily detached from the underlying caseated tissue: over the rest of the tumour the skin showed congested caseous tubercles.

Left Prescapular Gland.—Measured 5 in. by 3½ in. by 2½, and weighed 12 ozs. On section the cortex was composed throughout of pinkish yellow caseated tissue showing a few fine whitish streaks of early calcification; the medulla was firm, fibroid, and studded with small caseous tubercles; the capsule was thickened.

Left Prepectoral Glands.—The spherical gland was 2 centimetres in diameter, and on section resembled the prescapular. The kidney-shaped gland was much enlarged (5 centimetres in length). On section the cortex was firm, grey, translucent, and studded with minute foci of caseation.

Right Prescapular and right Prepectoral Glands.—Contained numerous caseating nodules, up to 5 millimetres in diameter.

Cervical Glands.—Were œdematous, and contained discrete caseating nodules.

Abdomen:

Omentum.—On the inferior surface there were about three dozen flattened nodules, irregular in outline, varying greatly in size; the largest about 5 millimetres across, the smallest the size of a millet seed. The nodules were yellow in the centre, and some were deeply hæmorrhagic.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 8 ozs. On section the pulp contained numerous firm yellow nodules, slightly grey around the margins, ranging from about 2 to 4 millimetres in diameter.

Liver.—Was pale. On the surface numerous nodules were seen; many of these were situated just under the capsule, or, projected slightly, whilst others were raised, flattened, and had overhanging margins; the largest were about 3 millimetres in diameter. On section the substance of the liver was beset with tubercles ranging in size from 0·5 millimetre (or less) up to 2 millimetres in diameter. The tubercles on the surface and in the depth had yellow centres and greyish margins.

Gall Bladder.—There were two or three rather large submucous caseous tubercles, and one erosion of the mucous membrane.

Portal Glands.—Were much enlarged; they showed in the cortex firm grey tissue in a state of early caseation (they resembled the mediastinal glands, but were not quite so advanced in caseation).

Kidney.—The left kidney showed on the surface about three dozen tubercles, ranging in size from a pin's head to a wheat grain; all the tubercles had yellow centres and grey translucent margins, the larger ones being elongated in a radial direction. In the depth of the cortex similar, but not so numerous, tubercles were seen.

The right kidney resembled the left.

Suprarenals.—The left suprarenal body contained three pin-head-sized caseating tubercles; the right contained one.

Thorax:

Heart.—Muscle was flabby; otherwise normal.

Pleura.—On the mediastinal pleura (dorsal and ventral) there was a number of greyish-white tubercles, the size of millet seeds; similar tubercles were seen here and there along the margins of the ribs and on the pleura covering the pericardium; in the latter region there were a few larger ones resembling those on the omentum. On the pleural surface of the diaphragm there were a few small tubercles; these were rather more numerous on the right than on the left side, and were arranged in little groups near the margin of the tendon. The loose tissues in the dorsal mediastinum were œdematous.

Lungs.—The ventral half of the left cephalic lobe, the greater portions of the right cephalic and middle lobes, and the extreme antero-ventral portions of the caudal lobes, were dark red, firm and solid; the rest of the caudal lobes were for the most part crêpitant, and showed only here and there a consolidated lobule.

The solid portions of the lung were very closely beset with nodules, ranging up to about 2 millimetres in diameter; the nodules had yellow centres and grey, translucent margins, and had, in many places, become confluent; those on the surface caused projections under the pleura. In the crêpitant portions of the lungs the nodules were not so numerous as in the solid, and in the caudal lobes were least numerous most posteriorly; they were generally discrete, but here and there groups of confluent nodules were seen. In the fringes around the margins of the caudal lobes there were a few small tubercles.

Mediastinal Glands, Bronchial Glands.—Were enlarged, weighing together 10 ozs.; the dorsal mediastinal glands alone weighed 6½ ozs. On section, the cortices were firm, grey, translucent, and mottled with irregular yellow patches and foci of caseation, forming in places an irregular network.

Infratracheal Glands, Peribronchial Glands.—Resembled the bronchial and mediastinal.

Tonsils.—Contained each a few caseous tubercles.

Pharynx, Palate, Tongue.—There were several similar tubercles in the corrugated mucous membrane in the vault of the pharynx, and one on the upper surface of the soft palate; two of the lymphoid follicles on the side of the tongue were greatly enlarged, ulcerated on the surface, caseous, and softened in the centre.

Larynx, Trachea.—Normal.

Small Intestine.—The long Peyer's patch in the ileum showed about eighteen yellow, caseous tubercles, the largest the size of a No. 4 shot; similar tubercles were sparsely distributed throughout the rest of the intestine.

Gastric Glands.—Contained discrete caseating nodules.

Mesenteric Glands.—Showed similar nodules; these were most numerous in the glands at the posterior extremity of the mesentery.

Ileo-Colic Glands.—In the ileo-colic glands the nodules were more numerous still, and were beginning to coalesce.

Colic Glands.—Were enlarged; all contained caseating nodules.

Bladder, Testicles, Eyes.—Normal.

Various Lymphatic Glands:

Cœliac.—One cœliac gland was composed practically throughout of firm, grey tissue, showing irregular patches of caseation. Other cœliac glands were beset with caseating nodules up to 2 millimetres in diameter.

Popliteal, Gluteal, Precrural, Pudic, Iliac, Sacro-Iliac, Submaxillary, Parotid, Retropharyngeal, Axillary, Ventral Mediastinal.—Contained numerous discrete caseating nodules, ranging in size up to 5 millimetres in diameter; the nodules were generally irregular in outline, and not definitely circumscribed.

Lumbar Glands, Renal Glands.—Were closely beset with caseating nodules.

All the hæmolymph glands were enlarged, and contained caseating nodules, their tissue being almost completely replaced.

Microscopical Examination.

Tongue.—A few tubercle bacilli.

Tonsil - - - - -	Numerous tubercle bacilli.
Suprarenal Body - -	

VIRUS B XI.

July 12, 1904.

MEDIASTINAL GLANDS.

The mediastinal glands of an adult cow were slightly enlarged, and showed beneath their capsules yellow nodules and internally yellow caseous gritty masses with foci of softening. The left bronchial gland was affected. Lungs and all other organs and glands were normal.

VIRUS B XI.

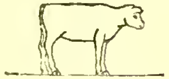
(July 11, 1904.)

MEDIASTINAL GLAND.

Culture Inoculations.

Inoculated on February 8th, 1905, with Culture derived from the original material through Rabbit 66. (Omentum).

The Culture was the 7th generation, 22 days old, and had been in cultivation for a total period of 154 days.



CALF 232.

Subcutaneous.

Dose : 50 mg.

Killed, very ill, March 15th, 1905 (35 days).

P.M.—General tuberculosis.

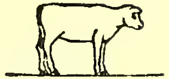
RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
163	1·0 mg.	Intravenous	D. 13 days	G.T.
162	0·1 mg.	Intravenous	D. 18 days	G.T.
165	1·0 mg.	Subcutaneous	D. 55 days	G.T.

Inoculated on February 18th, 1905, with Culture derived from the original material through Rabbit 66. (Mediastinal Gland).

The Culture was the 7th generation, 19 days old, and had been in cultivation for a total period of 164 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
186	1·0 mg.	Intraperitoneal	D. 17 days	G.T.
187	1·0 mg.	Intraperitoneal	D. 17 days	G.T.
184	0·1 mg.	Intraperitoneal	D. 28 days	G.T.
185	0·1 mg.	Intraperitoneal	D. 27 days	G.T.
188	1·0 mg.	Subcutaneous	D. 67 days	G.T.



CALF 234.

Subcutaneous.

Dose : 50 mg.

Died, March 18th, 1905 (38 days).

P.M.—General tuberculosis.

CALF 232.

Subcutaneous Inoculation of culture derived from the original material of Virus B XI. through Rabbit 66.

Date—February 8th, 1905.

Dose—50 milligrammes.

Weight—(February 14th) 1 cwt. 2 qrs. 11 lbs. [Age—12 weeks.]

Killed—When very ill. March 15th, 1905. 35 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on February 8th, 1905.

A week later there was a swelling at the seat of inoculation measuring 3 in. by 2¾ in.; the left prescapular gland was rather less than 3 in. in length.

On February 21st, 1905, 13 days after inoculation, the tumour was larger and more prominent; the gland measured 4 in. in length.

On March 8th, 1905, the tumour had become almost spherical, measuring 5 in. in greatest diameter, and appeared to be undergoing softening; subsequently the tumour became converted into a bag of fluid.

Signs of illness were first noticed on March 2nd, 1905, 22 days after inoculation; the respirations were visibly increased and the animal appeared to be losing flesh.

The illness rapidly became more acute; the respirations increased in frequency, the appetite diminished and the calf became progressively thinner and weaker.

It was killed when very ill on March 15th, 1905, 35 days after inoculation.

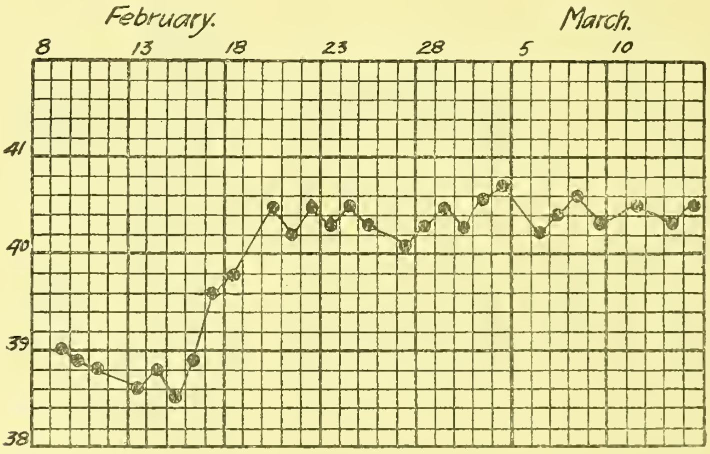
Weights.

From February 14th, when the calf was first weighed, until the end of the experiment, there was a steady decline in weight.

	cwt.	qrs.	lbs.
February 14th, 1905 - - -	1	2	11
February 21st, 1905 - - -	1	2	7
February 28th, 1905 - - -	1	2	4
March 7th, 1905 - - - -	1	1	21
March 14th, 1905 - - - -	1	1	13

Loss in Weight.—26 lbs.
Rate of loss per week.—6·23 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was a soft fluctuating tumour (5 in. by 4 in. by 2½ in), which on section was found to be a cyst, with reddish yellow slightly turbid serous contents and caseo-necrotic walls, very irregular and shreddy internally. The skin over the tumour was closely adherent, thickened, and studded with congested yellow tubercles.

The muscles between the local tumour and prescapular gland showed several small tubercles; there was also a slightly thickened caseating lymphatic vessel.

Left Prescapular Gland.—Measured 4½ in. by 2½ in. by 1⅔ in., and weighed 7 ozs. On section it was partly composed of dense pinkish-yellow caseo-necrotic tissue, and partly of grey translucent tissue closely studded with caseous foci.

Left Prepectoral Glands.—Showed caseating nodules 2 to 3 millimetres in diameter.

Right Prescapular and Right Prepectoral Glands.—Contained discrete caseating nodules, 1·5 to 3 millimetres in diameter.

Cervical Glands.—A lower cervical gland on the left side was enlarged, and consisted throughout of grey translucent tissue studded with caseous foci.

The left mid cervical glands and the cervical glands on the right side of the neck were slightly enlarged, and beset with discrete caseating nodules.

Near the left mastoid process there was a hard gland which measured 1⅓ in. by 1⅓ in. by 1 in., and on section consisted throughout of dense yellow caseated tissue. (The reason why this gland was so extensively caseated was because the local tumour was situated much nearer the angle of the jaw than usual.)

In close proximity to the above gland there was a large soft gland, which was closely beset with discrete caseating nodules.

Abdomen :

Omentum.—Showed on its inferior surface numerous flattened caseating nodules, ranging in size from a pin's head to a split pea; many were loosely attached to the membrane, and were deeply hæmorrhagic; others occurred in small clusters.

Similar nodules were seen on the parietal peritoneum near the spleen, and on the peritoneal surface of the diaphragm there were several large clusters.

Spleen.—Was enlarged (weight 1 lb. 5 ozs.). On the convex surface there were several groups of nodules similar to those on the peritoneum; on section the pulp was packed with firm nodules, mostly about 2·5 millimetres in diameter.

Liver.—Was enlarged and soft; the substance was closely beset with grey nodules, slightly opaque in the centre, ranging in size from 1 to about 2·5 millimetres in diameter; on the surface many of the nodules projected under the capsule, those on the convex surface being flattened out, whilst those on the concave were prominent and rounded.

Gall Bladder.—Normal.

Portal Glands.—Were greatly enlarged. They showed in the cortices confluent masses of firm translucent tissue studded with caseous foci.

Kidneys—The left kidney showed on the surface about two dozen grey tubercles ranging in size from a pin's head to that of a millet seed: the majority of the tubercles were spherical, but some extended for some distance into the cortex; in the depth of the cortex only a few tubercles were seen.

The right kidney showed about the same number of tubercles as the left.

Suprarenal Bodies.—The left suprarenal body showed in the cortex one grey tubercle the size of a pin's head.

Right suprarenal body normal.

Thorax:

Heart.—Muscle and valves normal.

Pericardium.—The parietal pericardium and the pericardium covering the great vessels presented several large clusters of nodules, the largest the size of a wheat grain; the nodules were surrounded by velvety red vegetations.

Pleura.—The parietal pleura, the mediastinal pleura, the pleural surface of the pericardium, and that of the diaphragm, showed numerous nodules similar to those on the peritoneum; on the parietal pleura they were situated along the margins of the ribs, and occurred in many places in groups; most of the nodules were surrounded by a narrow fringe of delicate congested connective tissue.

Lungs.—The cephalic lobes, the right middle lobe, and the antero-ventral portions (one-third) of the caudal lobes, were heavy, dark and completely hepatised; they were closely beset with grey nodules, 1 to 2 millimetres in diameter, those under the pleura causing slight projections. The nodules showed a very slight amount of central necrosis. The bronchi in these solid portions were filled with muco-pus. The crepitant parts of the caudal lobes contained tubercles similar to those in the consolidated lobes, but in much smaller number; many of these tubercles were surrounded by zones of congestion. In the fringes around the margins of the caudal lobes there were a few small tubercles.

Mediastinal Glands.—The dorsal mediastinal glands were moderately enlarged (four weighed 5 ozs.). On section they showed in the cortices firm grey tissue in a state of early caseation.

Bronchial Glands, Peribronchial Glands.—Were considerably enlarged, and on section resembled the mediastinal.

Below the trachea, in front of the heart, there were three enlarged glands; one resembled the mediastinal, the others contained discrete nodules.

Tonsils.—In the substance of each tonsil there were a few caseating nodules.

Tongue—Several of the lymphoid follicles at the base of the tongue were enlarged, but were not obviously caseous (a smear preparation made from one showed tubercle bacilli).

Pharynx.—The corrugated mucous membrane in the vault of the pharynx showed numerous congested caseating nodules.

Trachea.—On the mucous membrane of the trachea, near the larynx, there were some small congested caseous ulcers, and on one of the arytenoid cartilages there was a small tubercle.

Small Intestine.—All the Peyer's patches in the small intestine contained caseous tubercles; in the long patch in the ileum they were very numerous.

Large Intestine.—The solitary lymphoid follicles in the large intestine were enlarged and caseating, the mucous membrane over them being congested.

Testicles, Eyes, Thyroid Body.—Normal.

Various Lymphatic Glands:

Gluteal, Popliteal, Precrural, Pudic, Iliac, Ileo-Sacral, Gastric, Mesenteric, Colic, Ventral Mediastinal, Parotid, Submaxillary, Retropharyngeal.—All contained numerous discrete caseating nodules, ranging from 1·5 to 2·5 and 3 millimetres in diameter; some of the glands were appreciably enlarged.

Lumbar Glands, Right Renal Gland.—Were enlarged, and packed with caseating nodules.

Ischiatic Glands.—The right ischiatic gland contained one small nodule; the left gland was not found.

Cœliac Glands.—Resembled the portal.

All the hæmo-lymph glands contained caseating nodules.

Microscopical Examination.

Trachea.—A few tubercle bacilli.

Colon.—Numerous tubercle bacilli.

Follicle at Base of Tongue	A few tubercle bacilli.
Left Suprarenal - - - -	

CALF 234.

Subcutaneous Inoculation of culture derived from the original material of Virus B XI., through Rabbit 66.

Date—February 8th, 1905.

Dose—50 milligrammes.

Age—10 weeks. Weight, February 14th, 1905.

Died—March 18th, 1905. 38 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on February 8th, 1905.

Seven days later there was a firm swelling measuring 4 in. by 2 in. by about ¾ in.; the prescapular gland was enlarged and measured 3 in. in length; a prepectoral was slightly enlarged.

On March 2nd, 1905, 22 days after inoculation there was a prominent elongated tumour measuring 6 in. from above downwards and 4 in. in greatest width; it showed in the skin over the upper part a small opening discharging yellow serous fluid; the prescapular gland measured 5 in. in greatest length and the prepectoral glands were considerably enlarged; the tissues between the local tumour and the glands were thickened and œdematous. The general condition was fair, and the respirations were not increased; the calf, however, appeared to be losing flesh.

Shortly after this the calf became obviously ill; the respirations gradually increased in frequency and finally became laboured; there was marked loss in flesh; towards the end of the experiment severe diarrhœa set in and the calf became extremely weak.

It died on March 18th, 1905, 38 days after the experiment began.

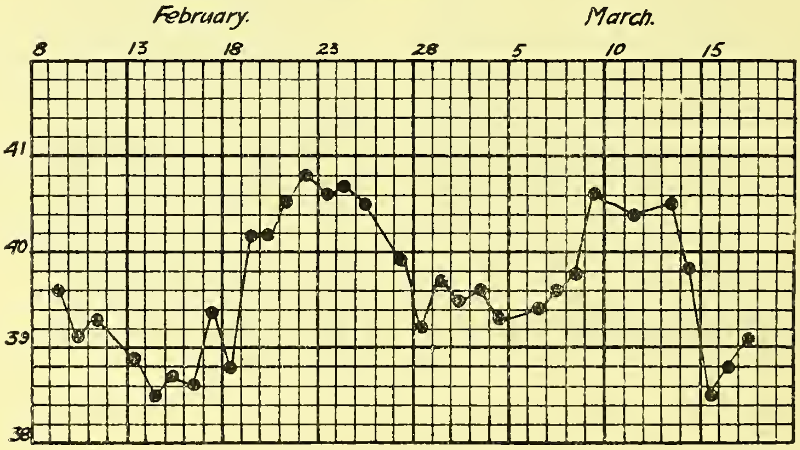
Weights.

From February 14th to March 14th, 1905 there was a slow steady decline in weight; during the last four days the calf lost 16 lbs.

	qrs.	lbs.
February 14th, 1905	3	10
February 21st, 1905	3	8
February 25th, 1905	3	7
March 7th, 1905	3	6
March 14th, 1905	3	5
March 18th, 1905	2	17

Loss in Weight.—21 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Very emaciated.

Local Lesion.—On the left side of the neck there was an elongated tumour, measuring 7 in. vertically, 4½ in. from before backwards, and 2 in. in thickness at the upper part; the inferior portion of the tumour gradually diminished in thickness, and curved round the trachea in the loose tissues of the neck.

On section the tumour was composed of the usual pinkish yellow caseated tissue, adherent to and infiltrating both skin and muscle: in the upper part this tissue was almost completely replaced by an irregular cavity, 3 in. by 2½ in. by 1½ in., filled with slightly turbid reddish serous fluid, and lined internally by soft necrotic tissue, masses of which were loosely attached to the wall; the cavity communicated externally by a small aperture through the skin, which was covered with dried discharge. The lower part of the tumour was dense and firm throughout.

Between the local tumour and the neighbouring glands there were several thickened and caseous lymphatic vessels, varying in thickness from that of a crow quill to that of a cedarwood pencil; two of these could be traced to the prepectoral glands, and one each to the prescapular and a mid-cervical gland.

Left Prescapular Gland.—Weighed 7 ozs., and measured 3¾ in. by 2½ in. by 2 in. On section it was composed practically throughout of dense yellow caseated tissue, showing here and there fine opaque streaks and foci of beginning calcification. The gland capsule was greatly thickened.

Right Prescapular Gland.—Was enlarged and congested. At each extremity there was a firm caseous mass, and in the rest of the gland very numereous discrete caseating nodules.

Left Prepectoral Glands.—Were much enlarged. Two, the size of walnuts, were caseous throughout: two others were beset with caseous nodules. The spherical prepectoral (one of the two former) was found in the midst of a mass of firm fibroid tissue, closely studded with caseous nodules

Cervical Glands.—Along the carotid artery there was a chain of five glands, the largest (lying under the extension of the local tumour round the trachea) measured 1½ in. by 1 in. by ¾ in.; all were hard and caseous throughout, with the exception of the lowest, which showed a third of its substance caseous, the rest being studded with caseous nodules.

On the right side, in the middle of the neck, th re was a gland the size of a filbert, which was practically caseous throughout; other cervical glands on the right side were enlarged, and beset with caseating nodules.

Abdomen :

Omentum.—The omentum, on its inferior surface, showed numerous lenticular nodules, the largest about 3 millimetres in diameter; many were loosely attached, and in some hæmorrhage had taken place. The nodules were slightly opaque in the centre, and showed around their margins a narrow congested fringe; in the centres of the polygonal areas of the omentum there were also numerous small hard granules.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 12 ozs. On the surface there was one small lenticular nodule; the pulp was crowded with yellow tubercles, varying between 1 and 1·5 millimetre in diameter. (In the fellow calf, No 232, which lived a shorter time, the tubercles were much larger.)

Liver.—Was engorged with blood, but was little, if at all enlarged. The substance showed numerous evenly distributed opaque tubercles, varying in size from that of a mustard seed to that of a small shot; many tubercles projected from the surface and were flattened out, these were generally larger than those in the depth of the liver, some being the size of wheat grains.

Portal Glands.—Were very large, weighing together 3 ozs. On section they resembled the mediastinal.

Gall Bladder.—Under the mucous membrane there was a pinhead-sized yellow tubercle.

Kidneys.—Left kidney showed in the cortex numerous opaque grey tubercles, ranging in size from a pin's head to a millet seed.

Right kidney showed similar tubercles.

Suprarenals.—Left suprarenal. In the cortex there was a small grey tubercle.

Right suprarenal normal.

Thorax:

Pleura.—The fringes along the margins of the ribs were here and there congested; on the left side there were about half a dozen small lenticular nodules; on on the right side there was about the same number of nodules, and in the fringes along some of the ribs were clusters of pinhead-sized tubercles.

On the left side of the tendon of the diaphragm there were a few (less than a dozen) flattened caseating nodules.

On the pleural surface of the pericardium there were numerous caseous nodules, mostly about the size of wheat grains.

Pericardium.—There were several similar nodules on the pericardium covering the great vessels; these were surrounded by reddish velvety vegetations.

Heart.—Under the pericardium, in the muscle of the right ventricle, there was a caseous tubercle; there was a similar tubercle on the surface of the left ventricle, near the coronary artery.

Heart muscle and valves normal.

Lungs.—The cephalic lobes were purplish red in colour, and quite airless; the antero-ventral portion of the left caudal lobe was completely consolidated, and there were many consolidated lobules in the rest of the lobe. The right caudal lobe showed no large areas of consolidation, merely patches of congestion around some groups of tubercles; the bronchi in the solid lobes were filled with muco-pus.

The lung parenchyma was evenly and closely beset with caseating tubercles, ranging in size from a pin's head to a millet seed.

There were no tubercles in the fringes around the margins of the lungs.

Thoracic Glands.—In the dorsal mediastinum there was a chain of enlarged glands. These on section showed irregular yellow patches of caseation, surrounded by pinkish translucent tissue.

The bronchial, peribronchial, and infra-tracheal glands, were enlarged, and resembled the mediastinal.

The œsophageal glands were beset with caseating nodules.

The ventral mediastinal glands (above the manubrium sterni) were deeply congested, and closely beset with caseating nodules.

In the fold of mediastinal pleura at the apex of the heart, and in the caval fold of pleura, there were two glands which resembled the ventral mediastinal.

Tongue.—The solitary lymphoid follicles along the sides and at the base of the tongue were enlarged, indurated and caseating.

Pharynx.—There were numerous caseous tubercles in the mucous membrane of the pharynx and upper part of the œsophagus.

The corrugated mucous membrane in the vault of the pharynx was packed with caseating nodules, and there were several caseous tubercles in the mucous membrane at the back of the nose.

Tonsils.—Were closely beset with caseating nodules.

Larynx.—There were a few small tubercles on the vocal cords.

Trachea.—Was filled with froth. The mucous membrane showed along its whole length numerous small slightly raised, caseous ulcers, with congested margins.

Stomach.—On the mucous surface of the stomach there were numerous projecting caseating nodules, the largest 2·5 millimetres in diameter; a few nodules were felt under the mucous membrane.

Intestines.—The small intestine in this calf was more severely affected than in any other calf inoculated with 50 milligrammes of culture; throughout the whole length Peyer's patches and mucous membrane were studded with millet seed-sized tubercles; they were exceptionally numerous in the long Peyer's patch, and were not so numerous in the anterior portion of the duodenum. The mucous membrane over them was congested.

Large Intestine.—The solitary follicles in the large intestine were slightly enlarged and hardened. Some appeared to be caseating.

Gastric Glands, Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Were slightly enlarged. Their cortices were packed with confluent caseating tubercles. In some the cortex was made up of translucent grey tissue, studded with caseous foci. The serous membrane covering the mesenteric glands was deeply congested.

Bladder.—Under the mucous membrane there was a pin-head-sized tubercle.

Eyes, Brain.—Normal.

Various Lymphatic Glands:

Submaxillary, Retropharyngeal.—Were enlarged, congested, and packed with caseating nodules, which in several places were becoming confluent.

Parotid, Mastoid, Deep Cervical, Ilio-Sacral, Iliac, Precrural, Popliteal, Gluteal, Ischiatic, Axillary, Right Prepectoral, Vertebral.—Were slightly enlarged, and closely beset with caseating nodules, ranging from 1 to 2 or 2·5 millimetres in diameter.

Cœliac.—Were enlarged, and consisted throughout of firm pinkish grey tissue, far advanced in caseation.

Lumbar, Renal.—Resembled the coeliac, but were not so advanced.

All the hæmo-lymph glands were beset with caseating nodules.

Microscopical Examination.

Gall Bladder -
Left Suprarenal - } Numerous tubercle bacilli.
Stomach -

Intestine.—Very numerous tubercle bacilli.

Heart -
Bladder } A few tubercle bacilli.
Trachea

VIRUS B XII.

July 28, 1904.

LUNG AND MEDIASTINAL GLAND.

The specimens were taken from a bullock in good condition and only two tuberculous foci were found in the whole body. One was a nodule in the lung, the size of a pigeon's egg, filled with yellow caseo-pus. The other was a very enlarged mediastinal gland which was packed with yellow gritty tubercles and contained a cavity filled with gritty caseo-pus.

VIRUS B XII.

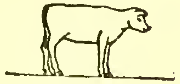
(July 28th, 1904.)

MEDIASTINAL GLAND.

Culture Inoculations.

Inoculated on April 29th, 1905, with Culture derived from original material.

The Culture used was the 12th generation, 20 days old, and had been in cultivation for a total period of 275 days.



CALF 274.

Subcutaneous.

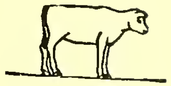
Dose : 50 mg.

Died, May 23rd, 1905 (24 days)

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
283	0·1 mg.	Intravenous	D. 24 days	G.T.
281	1·0 mg.	Intraperitoneal	D. 18 days	G.T.
282	1·0 mg.	Intraperitoneal	D. 22 days	G.T.
280	0·1 mg.	Intraperitoneal	D. 19 days	G.T.



CALF 276.

Subcutaneous.

Dose : 50 mg.

Died, June 7th, 1905 (39 days).

P.M.—General tuberculosis.

Inoculated on March 22nd, 1905, with Culture derived from the original material, through Rabbit 98.

The Culture used was the 9th generation, 20 days old, and had been in cultivation for a total period of 193 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
231	1·0 mg.	Intraperitoneal	D. 25 days	G.T.
230	0·1 mg.	Intraperitoneal	D. 40 days	G.T.
232	1·0 mg.	Subcutaneous	D. 42 days	G.T.
233	1·0 mg.	Subcutaneous	D. 80 days	G.T.

CALF 274.

Subcutaneous Inoculation of culture derived from the original material of Virus B. XII.

Date—April 29th, 1905.

Dose—50 milligrammes.

Weight—May 2nd, 1905, 2 qrs. 16 lbs. [Age—7½ weeks.]

Died—June 7th, 1905. 39 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 29th, 1905.

Eleven days after inoculation there was an oval firm swelling measuring 3½ in. in length, 2½ in. in breadth and about ¾in. in greatest thickness; the left prescapular gland was 3 in. in long diameter.

On May 19th, 1905, 20 days after inoculation, the tumour attained its maximum, 4 in. by 3 in.; the tumour was wholly subcutaneous and the skin over the central part was thinned and on the point of breaking down; the prescapular gland measured 3½ in. in length; the prepectoral glands were not obviously enlarged. One of the lower cervical glands was enlarged and indurated. The calf seemed to be losing flesh, the coat was rough and the respirations were increased in frequency.

The skin over the centre of the tumour necrosed and a deep fissure appeared which discharged turbid fluid; subsequently a slough separated and a deep foul-smelling ulcer was formed.

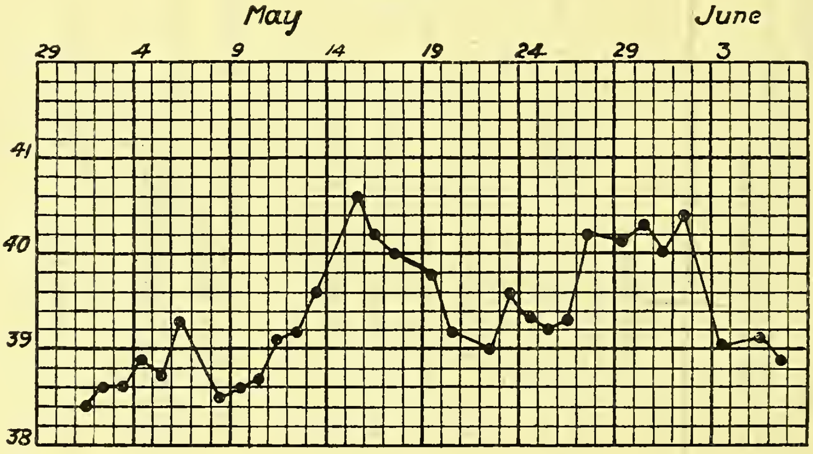
The calf gradually became thinner and weaker and the respirations more frequent (rate on June 2nd 88 per minute). It was found dead on the morning of June 7th, 1905, 39 nine days after inoculation.

Weights.

	qrs.	lbs
May 2nd, 1905 - - - - - -	2	16
May 25th, 1905 - - - - - -	2	25
June 7th, 1905 - - - - - -	2	18

Gain in weight.—2 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—On the left side of the neck there was a deep extremely foul excavation, with raised undermined margins and dirty brownish necrotic floor, partly covered by a dry black slough. The ulcer was situated in the upper part of the local tumour, from which more than two-thirds of the middle necrotic portion had sloughed away. On section through the tumour, which measured 4 in. by 3 in. by 1 in., the ulcer was found to penetrate down to the muscular layer. In the lower part of the tumour, between the skin and muscles, there remained a small mass of firm pinkish yellow caseo-necrotic tissue. The subjacent muscles were infiltrated for a short distance with yellow caseous tubercles.

Left Prescapular Gland.—Weighed about 3 ozs., and measured 2¾ in. by 1⅓ in. by ¾ in. On section the greater part of the gland was composed of dense yellowish white somewhat translucent caseated tissue, containing numerous opaque whitish foci (of early calcification ?). Towards one extremity of the gland there was the usual pinkish yellow caseo-necrotic tissue.

Prepectoral Glands.—On the left side the rounded prepectoral, the size of a small pea, contained one pinhead-sized caseous tubercle. The kidney-shaped gland was slightly enlarged, and contained from six to eight yellow caseous tubercles, the largest 1·5 millimetre in diameter. The prepectoral glands on the right side contained discrete yellow caseous tubercles.

Cervical Glands.—One of the lower cervical glands on the left side was much enlarged (1¾ in. by 1 in. by a little over ½ in.). On section it consisted throughout of dense yellow caseous substance, with minute opaque whitish gritty foci scattered throughout. The left upper cervical gland, the size of a walnut, was similar on section; the gland external to the latter (hyoid ?) contained a pea-sized firm caseous nodule and numerous small caseous tubercles. Other cervical glands on the left side and all those on the right showed yellow caseous nodules ranging from 1 to about 1·5 millimetre in diameter.

A gland just within the entrance to the thorax, the size of a broad bean, showed half its cortex dense yellow and caseous, and the rest closely studded with caseous tubercles.

Abdomen :

Omentum.—On the inferior surface of the omentum there were about eighteen small flattened tubercles, (largest 1·5 millimetre) several of which were loosely attached and haemorrhagic.

Parietal Peritoneum.—Normal.

Spleen.—6 ozs. Showed in the pulp moderately numerous tubercles, the largest a little over 1 millimetre in diameter, with yellow necrotic centres and congested margins.

Liver.—Was dark in colour and full of blood. The substance contained not very numerous opaque caseous tubercles, ranging in size from a mere point to about 1 millimetre in diameter.

Gall Bladder.—Showed two minute yellow tubercles under the mucous membrane.

Portal Glands.—Were much enlarged. The cortices were firm and well advanced in caseation: the medullae were soft and œdematous.

Kidneys.—The capsules were very adherent, and were with difficulty stripped off; the kidney substance was pale and tough; the cortical zones appeared to be reduced in thickness.

On the surface of the left kidney four grey miliary tubercles with caseous centres were seen; a few similar tubercles were found in the depth of the cortex, and one in the medullary zone.

On the surface of the right kidney there were about a dozen tubercles; on section a few tubercles were seen in the medulla; none in the deeper parts of the cortex.

Suprarenals.—The left suprarenal body contained a pinhead-sized caseating tubercle; the right was normal.

Thorax:

Heart.—Normal.

Pleura.—On the caval fold of pleura there was one caseous nodule the size of a wheat grain, and three or four congested tubercles; no tubercles were seen on any other part of the pleura.

Lungs.—The anterior lobes were extensively consolidated; the right cephalic and right middle lobes were dark red and airless. The left cephalic lobe had a few air-containing lobules along the dorsal border and posterior margin, and just floated in water; in the caudal lobes individual nodules and small groups of nodules were surrounded by dark red zones or areas, irregular in outline; those in the antero-ventral regions were very numerous and had run together, causing almost complete consolidation. The tissues of the lung were crowded with greyish-yellow caseous tubercles, ranging in size up to about 2 millimetres in diameter, majority about 1 millimetre. The tubercles were irregular in outline, and had in many places become confluent. Many of the nodules showed in the centre a minute opaque focus (beginning calcification?)

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged; the cortex was firm, yellowish-white in colour, and well advanced in caseation, only a small amount of grey translucent tissue remaining; minute gritty foci were scattered throughout. Four small glands anterior to the latter were similar, but the whole of their cortices was not affected. A long gland above the bifurcation was caseating throughout, except for a narrow band of congested tissue along the hilum.

Bronchial Glands.—Were similarly affected.

The bronchial and mediastinal glands together weighed 3 ozs.

One infra-tracheal gland resembled the bronchial; another was closely beset with confluent caseating nodules.

Tonsils.—Contained each three or four yellow caseous ubercles.

Tongue.—Several of the follicles at the margins of the ongue were enlarged and had caseous softened centres; t the base of the tongue there was a small caseous ulcer.

Pharynx.—The corrugated mucous membrane in the vault of the pharynx contained numerous yellow softened tubercles; the rest of the pharyngeal mucous membrane was congested, but showed no tubercles.

Trachea.—The mucous membrane of the trachea showed two minute grey tubercles.

Intestines.—In the small intestine the long Peyer's patch was thickly beset with yellow caseous and softened tubercles, all about 1 millimetre or a little over in diameter. Similar tubercles were seen in other parts of the small intestine, but these were not so numerous as in the long patch; they were situated under the mucous membrane as well as in Peyer's patches.

In the anterior part of the large intestine there were fairly numerous slightly raised yellow tubercles, with soft yellow centres (enlarged follicles?)

Mesenteric Glands.—Were not appreciably enlarged. They felt firmer than normal, and showed in the cortex numerous yellow caseous foci (none larger than 2 millimetres), irregular in outline; the tissue surrounding these foci, especially in the terminal glands, had a greyish translucent appearance, as if infiltrated with cells.

Colic Glands.—Several of the colic glands were enlarged, and consisted practically throughout of firm grey tissue beset with caseous foci; others contained discrete caseous tubercles.

Gastric Glands.—Were closely beset with caseous tubercles.

Eyes, Thyroid Body, Testicles.—Normal.

Various Lymphatic Glands:

Coeliac.—One was enlarged, indurated, and showed irregular yellow caseous patches; a second gland contained numerous caseating nodules; two or three small glands contained small caseous tubercles.

Precrural.—Contained numerous discrete yellow caseous tubercles, irregular in outline, and ranging up to about 1·5 millimetre in diameter; in the centre of some of the larger tubercles a minute opaque yellowish white focus was seen (beginning calcification?)

Popliteal, Pudic, Gluteal, Iliac, Ilio-Sacral, Right Prescapular, Axillary, Ventral, Mediastinal, Parotid.—Contained similar tubercles.

Renal, Lumbar, Submaxillary, Retropharyngeal.—Were rather more closely beset with caseous tubercles, all of which, however, remained discrete.

Several hæmo-lymph glands contained pinhead-sized caseating tubercles.

Microscopical Examination.

Tonsil *Pharynx* (vault) *Colon* *Small Intestine*	Numerous tubercle bacilli.

Tongue.—Very numerous tubercle bacilli.

Suprarenal Body.—Moderately numerous tubercle bacilli.

CALF 276.

Subcutaneous Inoculation of culture derived from the original material of Virus B XII.

Date—April 29th, 1905.

Dose—50 milligrammes.

Weight—May 2nd, 1905, 2 qrs. 10 lbs. [Age—7½ weeks.]

Died—May 23rd, 1905.

Clinical History.

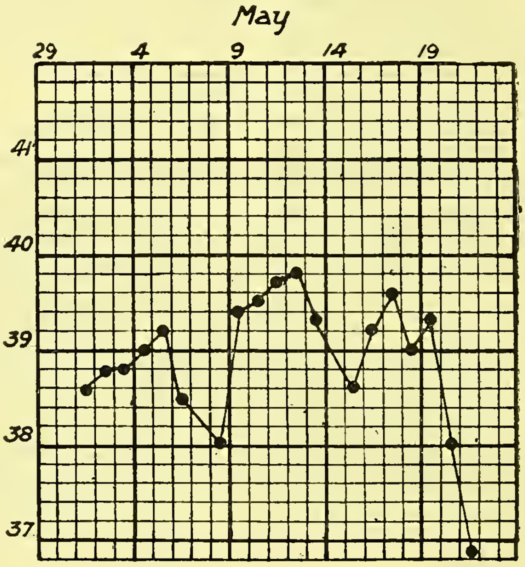
The calf was inoculated subcutaneously on the left side of the neck on April 29th, 1905.

Eleven days after inoculation there was an elongated swelling measuring 5 in. by 3 in. by 1 in., which extended into the loose tissues of the neck; the left prescapular gland measured 3 in.

The local lesion and gland increased in size subsequently, but only to a very slight extent.

The condition of the calf, when inoculated, was not very good; during the first three weeks of the experiment there was no change; then the calf gradually became thinner and weaker, and for twenty-four hours before death was unable to rise from the ground; the respirations, even during the latter part of the experiment, were not noticeably increased

Temperature.



Weights.

There was a steady loss in weight.

	qrs.	lbs.
May 2nd, 1905 - - - - - -	2	10
May 5th, 1905 - - - - - -	2	7
May 18th, 1905 - - - - - -	2	2
May 25th, 1905 - - - - - -	1	22

Loss in weight.—16 lbs.

Rate of loss per week.—4·87 lbs.

POST-MORTEM EXAMINATION.

Carcass.—Greatly emaciated.

Seat of Inoculation.—At the seat of inoculation, on the left side of the neck, there was an elongated tumour measuring 5 in. by 3 in. by about 1 in. in greatest thickness. On section it was composed of congested yellow necrotic tissue, infiltrating to a slight extent both skin and muscle; the tissue in the centre of the upper part of the tumour was spongy, and from it could be squeezed clear, watery fluid.

Left Prescapular Gland.—Measured 3 in. by 1¾ in. by 1 in. On section the greater part of the cortex was composed of pinkish yellow caseated tissue; a small patch near the hilum showed œdematous glandular tissue containing discrete tubercles.

Left Prepectoral Glands.—Were not enlarged nor obviously tuberculous.

Cervical Glands.—The left upper cervical gland, the size of a filbert, was indurated, yellow and caseous throughout; a gland external to the latter contained a nodule in a state of early caseation and a few discrete tubercles.

On the left side of the trachea there was a series of four enlarged glands, the largest the size of a broad bean, the smallest that of a kidney bean. These on section showed the greater part of the cortex firm, yellow and caseous.

The cervical glands on the right side appeared normal.

Abdomen :

Omentum.—On the inferior surface there were three or four minute congested tubercles.

Spleen.—Very small, weighed less than 3 ozs. Showed scattered throughout the pulp small grey, spherical bodies, probably enlarged Malphighian corpuscles.

Liver.—At first sight was normal. Close examination revealed a number of extremely minute grey foci, just visible to the naked eye, scattered throughout the substance.

Portal Glands.—Were not enlarged. The cortices of the larger ones (? firmer and greyer than normal) contained numerous discrete greyish-white foci; the smaller glands showed scattered greyish-white foci.

Gall Bladder.—Normal.

Kidneys.—In the cortex of each kidney, on the surface, two or three small grey tubercles the size of mustard seeds were seen.

Suprarenal Bodies.—Appeared normal.

Thorax :

Heart, Pleura, Diaphragm.—Normal.

Lungs.—The left lung was crepitant throughout, except for a small irregular patch of consolidation in the antero-ventral part of the caudal lobe. In the right lung the ventral flap of the cephalic lobe and the greater part of the right middle lobe was consolidated; in the right caudal lobe there were numerous irregular dark red areas of consolidation, seen principally on the external surface (the calf lay chiefly on its right side during the two or three days preceding its death). The lung tissue was evenly beset with numerous dark grey congested tubercles, ranging in size from a mere point to about 0·5 millimetres in diameter; the larger tubercles showed a faint indication of central necrosis.

Mediastinal Glands.—The caudal mediastinal gland was slightly enlarged. On section the cortex was firmer and greyer than normal, and showed yellow foci of necrosis, forming in places a fine network; the glands anterior to the latter showed more definite caseation.

The bronchial glands resembled the mediastinal, except that a few small patches in the cortex of each had a normal appearance.

The ventral mediastinal glands contained scattered greyish white foci.

Tongue, Pharynx, Tonsils, Trachea.—Appeared normal.

Small Intestine.—The long Peyer's patch showed fairly numerous minute whitish foci under the mucous membrane; other Peyer's patches contained similar foci, but in much smaller number, several not containing any. The patches in the anterior part of the intestine were closely studded on the mucous surface with yellow foci, which could be easily scraped away with the point of a scalpel (secretion in the mouths of the follicles).

Large Intestine.—Normal.

Gastric Glands.—Appeared normal.

Mesenteric Glands.—Contain scattered grey tubercles, some of which were beginning to caseate.

Colic Glands.—A few of the colic glands showed early tubercles.

Various Lymphatic Glands:

Gluteal Glands, Popliteal Glands, Precrural Glands, Pudic Glands.—Contained a few greyish-white discreet tubercles, irregular in outline.

Parotid Glands, Submaxillary Glands.—Contained fairly numerous pinhead-sized caseating tubercles.

Retropharyngeal Glands.—Contained a few similar tubercles.

Iliac Glands, Ilio-Sacral Glands, Lumbar Glands, Real Glands.—Each showed a few minute grey tubercles, slightly opaque in the centre.

Coeliac Glands.—In one coeliac gland there were grey tubercles in the cortex, just beginning to caseate. Other coeliac glands were normal to the naked eye.

Right Prescapular Gland.—Contained scattered greyish-white foci.

Right Spherical Prepectoral Gland.—Contained a congested grey tubercle.

Axillary Glands.—The right axillary gland showed one or two minute grey foci; the left axillary appeared normal.

Minute grey points were seen in several hæmo-lymph glands.

Testicles, Eyes.—Normal.

Microscopical Examination.

Right Iliac Gland *Mesenteric Gland*	Numerous tubercle bacilli.

Small Intestine:—

1. *Tubercle.*—Moderately numerous tubercle bacilli.

2. *Secretion in Mouth of Follicle.*—No tubercle bacilli.

Spleen.—A few tubercle bacilli.

Pudic Gland.—Moderately numerous tubercle bacilli.

COMMENT ON CALVES 274 AND 276.

Both these calves were younger than the majority that have been used for the 50 milligramme inoculations, and weighed rather less than the normal for calves of their age.

Calf 276 was in a poor state of health on arrival at Walpole, and during the time it was at the farm before inoculation there was no improvement in its condition; probably it had not recovered from the effects of its journey from Jersey.

After inoculation it gradually became thinner and weaker, and died before the disease had time to develop itself fully. The lesions produced were disseminated throughout the whole body, but were very minute and with difficulty made out, particularly in the liver, spleen and kidneys, and many of the lymphatic glands. Tubercles were more conspicuous in the lungs than in any other organ, but there was not a sufficient amount of consolidation to cause death; the consolidated areas in the right lung were probably the result of hypostasis, seeing that the animal lay chiefly on its right side during the few days preceding its death.

Calf 274 was also not in a vigorous state of health at the time of inoculation, but was in a much better condition than Calf 276.

VIRUS B XIII.

September 25, 1904.

MEDIASTINAL GLAND.

One tuberculous mediastinal gland was taken from a four months' old calf which had no other sign of tubercle. The gland, slightly enlarged, showed yellow points beneath the capsule, and internally discrete tubercles with yellow gritty centres.

VIRUS B. XIII.

(September 25th, 1904.)

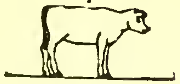
MEDIASTINAL GLAND

Culture Inoculations.

Inoculated on April 29th, with culture from the original material through Rabbit 116.

(The Rabbit died on November 26th, 1904.)

The culture used was the 12th generation, 20 days old, and had been in cultivation for a total period of 154 days.



CALF 268.

Subcutaneous.

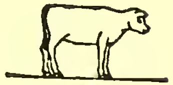
Dose : 50 mg.

Died, May 26, 1905 (27 days)

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
279	0·1 mg.	Intravenous	D. 20 days	G.T.
274	1·0 mg.	Intraperitoneal	D. 11 days	G.T.
276	1·0 mg.	Intraperitoneal	D. 13 days	G.T.
278	0·1 mg.	Intraperitoneal	D. 38 days	G.T.
275	1·0 mg.	Subcutaneous	D. 45 days	G.T.
277	1·0 mg.	Subcutaneous	D. 44 days	G.T.



CALF 272.

Subcutaneous.

Dose : 50 mg.

Killed, very ill, breaking rapidly, June 14, 1905

(46 days).

P.M.—General tuberculosis.

CALF 268.

Subcutaneous Inoculation of culture derived from the original material of Virus B XIII., through Rabbit 116.

Date—April 29th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. [Age—7½ weeks.]

Died—May 26th, 1905. 27 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left of the neck on April 29th, 1905.

Twelve days after inoculation there was a rounded swelling 4½ in. by 3¼ in.; the left prescapular gland was enlarged and measured 3½ in. in long diameter; a prepectoral gland was the size of a walnut.

On May 19th, 1905, three weeks after inoculation, the tumour was more prominent and larger, measuring 5 in. by 3½ in. in superficial area; the prescapular gland measured 4 in. in length; on this date signs of illness were first noticed; the rate of respiration was slightly increased, the coat was rough and the calf seemed to be losing flesh.

On May 23rd, 1905, there was a sudden increase in the respiratory rate, the breathing became very embarrassed and the calf died on May 26th, 1905, 27 days after inoculation.

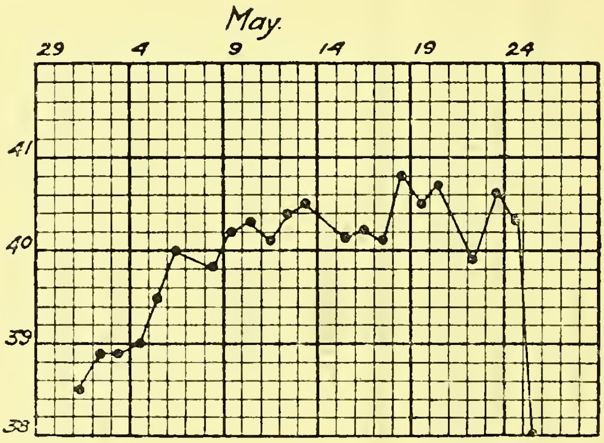
Weights.

The calf steadily lost weight.

	qrs.	lbs.
May 2nd, 1905 - - - - - -	3	0
May 10th to 23rd, 1905 - - - -	2	25
May 26th, 1905 - - - - -	2	17

Loss in weight.—11 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Slightly emaciated.

Local Lesion.—On the left side of the neck there was a firm tumour 4½ in. in length, and 3 in. in breadth. On removal and section it showed between the skin and muscles a lenticular mass of yellow caseo-necrotic tissue 1 in. in greatest thickness; in the upper half there was a flat space, with irregular necrotic wall filled with reddish serous fluid. The skin was thoroughly adherent and infiltrated, chiefly in its deeper layers; at one point, corresponding to the site of entry of the needle, caseated tissue extended almost up to the surface. The muscles were adherent and slightly infiltrated.

Left Prescapular Gland.—Weighed 3½ ozs., and measured 3¼ in. by 2 in. by 1½ in. On section the greater part of the cortex was composed of pinkish-yellow caseated tissue, the rest of firm, translucent tissue studded with caseous foci.

Left Prepectoral Glands.—The spherical prepectoral, the size of a walnut, was dense, yellow and caseous throughout. The kidney-shaped gland was œdematous, and contained a few miliary caseous tubercles; a third gland posterior to the latter showed one or two small tubercles.

A gland just within the thorax on the left side, ⅝ in. in diameter, was very hard, and composed throughout of yellow caseated tissue.

Cervical Glands.—The left upper cervical gland, the size of a thrush's egg, was indurated and caseating throughout (not so advanced as the spherical prepectoral); the gland external to the latter showed miliary caseous tubercles. A gland in the middle of the neck, the size of a large pea, was indurated and in a state of early caseation. Other left cervical glands and the right cervical glands contained discrete miliary caseating tubercles.

Abdomen:

Omentum.—On the inferior surface there were a few loosely attached flattened tubercles, the largest 2 millimetres in diameter; some were deeply hæmorrhagic.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 11 ozs. On section the pulp presented a coarsely granular appearance, and was crowded almost as closely as possible with miliary tubercles, slightly yellow in the centre.

Liver.—Normal in colour and firmness: showed evenly distributed throughout the substance numerous grey tubercles ranging in size from a mere speck to about 0·5 millimetre in diameter; some of the larger ones showed signs of central necrosis.

Gall Bladder.—Under the mucous membrane were two or three minute tubercles.

Portal Glands.—Were enlarged, and closely beset with grey miliary caseating tubercles, in several places aggregated together into small masses.

Kidneys.—Each kidney showed in the cortex fairly numerous tubercles similar to those in the liver.

Suprarenal Bodies.—There were a few minute pearly tubercles in the cortex of each.

Thorax:

Heart.—There was a pinhead-sized tubercle on the pericardium covering the aorta; on the endocardium of the right ventricle there were one or two minute grey foci. Heart muscle normal.

Pleura.—One minute tubercle on the pleural surface of the diaphragm; pleura was otherwise normal.

Lungs.—Were heavy; the cephalic lobes, the right middle lobe, the antero-ventral portions of the left caudal, and the greater part of the right caudal, were dark red and consolidated; the rest of the caudal lobes were congested, and showed patches of more recent consolidation. The lung tissue was evenly and closely beset with minute grey tubercles, slightly opaque in the centre.

Mediastinal Glands.—The dorsal mediastinal glands were moderately enlarged. The caudal gland showed the cortex closely beset with grey caseating tubercles, which in many places had become confluent; the glands anterior to the latter and the bronchial glands consisted practically throughout of firm grey tissue containing a yellow network. An infra-tracheal gland showed part of the cortex tuberculous. The right bronchial glands were deeply congested.

Trachea.—The mucous membrane showed very numerous, slightly raised, congested ulcerated foci, from the centres of which soft greyish material could be scraped.

Tonsils.—Contained numerous caseous tubercles.

Pharynx.—There were several pinhead-sized submucous caseous tubercles in the vault of the pharynx, posterior nares, and upper surface of the soft palate.

Under the mucous membrane at the sides and around the base of the tongue there were numerous small greyish white tubercles.

Small Intestines.—There were numerous opaque white tubercles, the largest the size of a pin's head, in the ileum; in the rest of the intestine they were rather less numerous; they occurred under the mucous membrane as well as in Peyer's patches; patches of the mucous membrane were intensely congested.

Large Intestine.—The lymphoid follicles appeared slightly enlarged, but were not opaque.

Gastric Glands, Mesenteric Glands, Colic Glands.—Contained discrete grey miliary tubercles, with opaque centres.

Various Lymphatic Glands:

Coeliac Glands.—One showed grey tissue in a state of early caseation; the others contained discrete caseating tubercles.

Gluteal Glands, Popliteal Glands, Precrural Glands, Pudic Glands, Ventral Mediastinal Glands, Parotid Glands, Submaxillary Glands, Retropharyngea Glands, Axillary Glands, Right Prepectoral Gland, Right Prescapular Gland.—Contained numerous discrete caseous tubercles, the largest about 1 millimetre in diameter.

There were numerous tubercles also in the *Iliac, Ilio-sacral* and *Lumbar Glands*; these were grey and semi-translucent.

All the hæmo-lymph glands examined showed caseating miliary tubercles.

Bladder, Testicles, Eyes.—Normal.

Microscopical Examination.

Small Intestine *Trachea* - - *Tonsil* - -	Numerous tubercle bacilli.

Tubercle from Palate.—Very numerous tubercle bacilli.

Suprarenal Body - - - *Large Intestine* (solitary follicle)	Moderately numerous tubercle bacilli.

CALF 272.

Subcutaneous Inoculation of culture derived from the original material of Virus B XIII., through Rabbit 116.

Date—April 29th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 2 lbs. [Age—7½ weeks.]

Killed—When very ill, June 14th, 1905. 46 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on April 29th, 1905.

Twelve days after inoculation there was a slightly raised swelling, 5½ by 3 in., triangular in outline; the left prescapular gland was greatly enlarged and measured 5 in. in long diameter; there was slight œdema of the dewlap.

Subsequently the tumour increased in thickness but very little in area; the gland diminished a little in size.

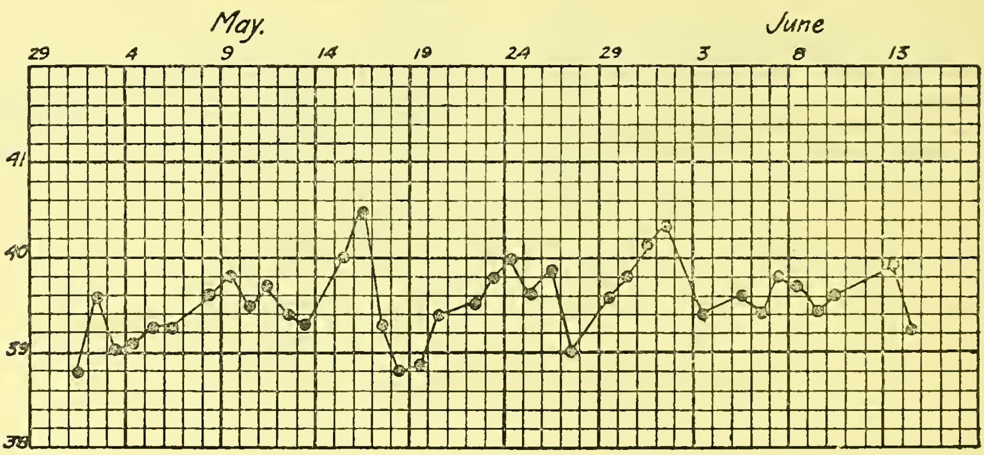
Until the end of May the general condition remained unchanged; then respiratory troubles appeared. On June 2nd, 1905, 33 days after inoculation, the rate of respiration was 60 per minute. The condition remained moderately good and there was very little wasting until towards the end of the experiment; the respirations however, became more and more laboured, expiration ending in a short grunt. On June 14th the respiration had become so embarrassed that it appeared unlikely that the calf would live more than a day a two longer; it was therefore killed. As the animal was being brought round to the post-mortem room it was noticed that the neck and shoulders were distended, as if with air, and crepitated on pressure.

Weights.

	qrs.	lbs.
May 2nd, 1905 - - - - -	3	2
May 23rd, 1905 - - - - -	3	7
May 30th, 1905 - - - - -	3	2
June 6th, 1905 - - - - -	3	9
June 13th, 1905 - - - - -	2	22

Loss in weight.—8 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition; neck and dorsal region of thorax was swollen, crackling on pressure as if from extravasation of air.

Local Lesion.—On the left side of neck there was a firm tumour, which measured 4¼ in. by 2½ in. by about 1 in. in greatest thickness. On section the tumour was composed of dense pinkish yellow caseo-necrotic tissue, tapering to a point at the lower extremity, and adherent to and slightly infiltrating both the skin and underlying muscles. The middle of the upper and thicker portion was somewhat spongy, and from it clear serous fluid could be squeezed.

Left Prescapular Gland.—Weighed 4 ozs., and measured 3¼ in. by 2¾ in. by 1½ in. On section it consisted throughout of dense pinkish yellow caseated tissue.

Right Prescapular Gland.—Contained yellow caseous tubercles, irregular in outline, scattered throughout the cortex.

Left and Right Prepectoral Glands.—Normal.

Right Axillary Gland.—Contained one pinhead-sized caseous tubercle.

Left Axillary Glands.—Normal.

Cervical Glands.—The left upper cervical showed about three quarters of its substance in a state of caseation; a lower cervical gland on the left side showed numerous caseous foci in the cortex; a mid-cervical gland contained a few caseous foci.

The right upper cervical gland contained moderately numerous caseous tubercles, irregular in outline; other glands on the right side contained caseous foci occurring chiefly in groups.

Abdomen:

Omentum.—On the inferior surface there were three or four small flattened tubercles.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 4 ozs. The pulp contained a moderate number of spherical tubercles, with grey margins and caseous centres, mostly about the size of a No. 4 shot.

Liver.—The capsule on the anterior surface showed two small filmy grey, almost transparent, growths. On the ventral surface there were two small pearly grey tubercles the size of pins' heads. In the substance, under the capsule, one minute yellow point was seen. On section the liver had a perfectly normal appearance, and no tubercles were seen, with the exception of one suspicious grey point.

Gall Bladder.—Normal.

Portal Glands.—Were slightly enlarged. Showed in the cortices numerous irregular caseous foci, uniting in places to form a caseous network.

Left Kidney.—Two or three minute grey points were seen on the surface. On section in the depth of the cortex there was a pinhead-sized grey tubercle, with a slightly opaque centre.

Right Kidney.—Showed on the surface four mustard seed sized grey tubercles, very slightly opaque in the centre. One slightly larger tubercle was seen in the depth.

Suprarenals.—The right suprarenal body showed in the cortex a minute whitish tubercle.

The left suprarenal body was normal.

Thorax :

Heart.—Normal.

Pleura.—On the parietal pleura there was one pinhead sized grey tubercle, surrounded by a deeply congested fringe.

On the pleural surface of the diaphragm there was a loosely attached millet seed sized hæmorrhagic tubercle.

Lungs.—Both cephalic lobes and the right middle lobe were firm, light reddish in colour, and almost entirely airless. They showed scattered throughout moderately numerous caseating tubercles, mostly about the size of a No. 4 shot; many of the subpleural tubercles were slightly raised above the surface. Several of the lobules in the posterior and dorsal parts of the left cephalic and right middle lobes felt firmer than other parts of the lobes, and showed on section firm grey translucent tissue, closely permeated with a fine yellow network. In the caudal lobes there were large irregular solid patches, affecting groups of lobules. These were sharply demarcated from the air-containing lobules, and were generally of a firmer consistence than the ordinary type of consolidation met with in the lungs of calves dying of an acute tuberculosis. On section these firm areas were composed of grey translucent tissue, mottled with streaks and foci of necrosis: they occurred chiefly in the dorsal and posterior parts of the lobes, and several of the lobules more advanced in caseation were slightly raised above the general surface. The antero-ventral region of the left caudal lobe resembled the left cephalic lobe, one or two of the marginal lobules showed early tuberculous infiltration. In the air-containing lobules and in the antero-ventral portion of the left caudal lobe there were moderately numerous caseating tubercles, ranging in size from a pin's head to a large shot.

There was an extensive extravasation of air into the loose tissues of the dorsal and ventral mediastina: there was no interstitial emphysema of the lungs. Air had been forced from the thorax, under the deep cervical fascia, into the loose tissues of the neck, and over almost the whole of the dorsal aspect of the trunk. Large bubbles of air were seen also under the peritoneum, around the margin of the thorax, and in the lumbar region. Several lymphatic glands, *e.g.*, the ventral mediastinal, the right prescapular and axillary glands showed minute bubbles of air throughout their substance.

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged; the cortex was firmer than normal, and beset with small irregular patches and foci of caseation forming in places a coarse network; the medulla was soft and slightly congested.

The other mediastinal glands and the bronchial glands were similarly affected; they weighed together about 3 ozs.

Tongue, Pharynx, Tonsils, Larynx, Trachea.—Normal.

Small Intestine.—The long terminal Peyer's patch contained numerous pinhead-sized caseous tubercles. Similar, but rather less numerous tubercles were seen in the rest of the ileum; they were situated under the mucous membrane, as well as in the lymphoid patches: in other parts of the small intestine they were more sparsely distributed, and were found chiefly in the patches.

Large Intestine.—Normal.

Mesenteric Glands.—Were rather severely affected. All showed in the cortex small irregular patches and foci of caseation, most numerous in the terminal glands; the latter appeared slightly enlarged, and their cortices were firmer and greyer than normal.

Gastric Glands.—Showed numerous irregular caseous foci in the cortex.

Colic Glands.—Contained similar foci; in some there were small irregular grey areas with caseous points.

Various Lymphatic Glands :

Cœliac Glands.—Two cœliac glands resembled the portal.

Precrural Glands.—Contained each a few pinhead-sized caseous tubercles.

Pudic Glands.—Contained rather more numerous tubercles many in little groups.

Popliteal Glands.—The left popliteal showed one caseous focus; the right fairly numerous irregular caseous tubercles.

Gluteal Glands.—The left gluteal contained scattered caseous foci; the right was normal.

Ischiatic Glands.—Normal.

Iliac Glands, Sacro-Iliac Glands.—Contained irregular caseous foci, scattered throughout the cortex.

Lumbar Glands, Renal Glands, Mastoid Glands. Parotid Glands, Submaxillary Glands, Pharyngeal Glands.—Contained numerous irregular caseous foci of various sizes, occurring often in little groups.

Haemo-lymph glands normal.

Mamma, Urinary Bladder, Eyes.—Normal.

Microscopical Examination.

Left Gluteal Gland.—Numerous tubercle bacilli.

Right Suprarenal Body.—A few tubercle bacilli.

Small Intestine.—Numerous tubercle bacilli.

VIRUS B XIV.

September 27, 1904.

PLEURA.

The pleura was taken from an aged cow which had lungs and pleura and thoracic glands affected. The specimen consisted of typical 'grapy' masses, in parts two inches thick, composed of firm translucent fibroid tissue thickly sown with gritty yellow areas of necrosis.

VIRUS B XIV.

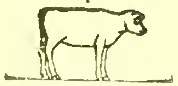
(September 27th, 1904.)

PLEURA "GRAPES."

Culture Inoculations.

Inoculated on April 8th, 1905, with Culture derived from the original material.

The Culture used was the 12th generation, 20 days old, and had been in cultivation for a total period of 193 days.



CALF 250.

Subcutaneous.

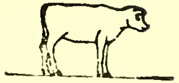
Dose : 50 mg.

Died, May 8th, 1905 (30 days).

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
252	1·0 mg.	Intravenous	D. 16 days	G.T.
248	0·1 mg.	Intravenous	D. 21 days	G.T.
245	1·0 mg.	Intraperitoneal	D. 19 days	G.T.
249	1·0 mg.	Intraperitoneal	D. 18 days	G.T.
247	0·1 mg.	Intraperitoneal	D. 27 days	G.T.
250	0·1 mg.	Intraperitoneal	D. 38 days	G.T.
246	1·0 mg.	Subcutaneous	D. 86 days	G.T.
251	1·0 mg.	Subcutaneous	D. 89 days	G.T.



CALF 252.

Subcutaneous.

Dose : 50 mg.

Died, May 16th, 1905 (38 days).

P.M.—General tuberculosis.

CALF 250.

Intramuscular Inoculation of culture derived from the original material of Virus B XIV.

Date—April 8th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 14 lbs. [Age—15 weeks.]

Died—May 8th, 1905. 30 days after inoculation.

Clinical History.

The calf was inoculated in the muscles on the left side of the neck on April 8th, 1905.

Eleven days later a deep-seated swelling, 3½ in. in diameter. was felt at the site of inoculation; the prescapular gland measured 3 in. long in diameter. On May 2nd, 1905, 24 days after inoculation, the tumour was larger and projected slightly from the surface; the margins were somewhat ill-defined; the skin was not adherent except at one point which corresponded to the site of entry of the needle; the prescapular gland measured 4½ in. in length; a prepectoral gland was slightly enlarged. The respirations were visibly increased, the coat was "staring" and the calf appeared to be losing flesh.

The animal then rapidly became worse; the respiration gradually increased in frequency (70 per minute on May 7th) and finally became very laboured; the appetite diminished, and on the day before death no food of any description was taken. There was progressive emaciation, and on May 7th, 1905, the calf was so weak that it was unable to rise from the ground. On the morning of May 8th, 1905, 30 days after inoculation, the calf was found dead.

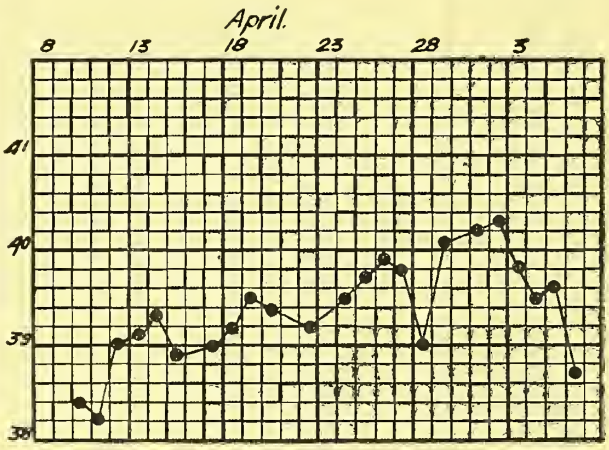
Weights.

	qrs.	lbs.
April 11th, 1905 - - - - -	3	14
April 19th, 1905 - - - - -	3	17
April 25th, 1905 - - - - -	3	14
May 2nd, 1905 - - - - -	3	7
May 8th, 1905 - - - - - -	2	22

Loss in weight.—20 lbs.

Rate of loss per week.—4⅔ lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Very emaciated.

Local Lesion.—The local lesion was situated wholly in the muscles on the left side of the neck. The skin was only adherent at one point, corresponding to the site of entry of the needle; here there was a small patch of caseation in the subcutaneous tissues. On removal the infiltrated muscles formed a mass which weighed 13 ozs., and measured 4½ in. by 3½ in. by 2 in. On section the mass was practically entirely composed of dense pinkish yellow necrotic tissue, showing numerous foci of congestion; around the margins there was a narrow zone of fibroid muscular tissue, with foci of caseo-necrosis.

Left Prescapular Gland.—Weighed a little over 3 ozs., and measured 3½ in. by 2 in. by 1½ in. On section the cortex was composed throughout of dense yellow caseated tissue; the medulla was congested, and showed discrete caseous foci; the capsule was slightly thickened.

Prepectoral Glands.—The rounded prepectoral gland on the left side was slightly enlarged, deeply congested, and showed minute discrete greyish white foci in the cortex; the kidney-shaped gland contained numerous caseous tubercles.

The gland under the left scalenus anticus was indurated, and enlarged to the size of a pigeon's egg. On section it was extensively caseated, but not so advanced as the prescapular.

The right prepectoral glands were closely beset with caseating miliary tubercles.

Cervical Glands.—Were beset with caseous tubercles, as in the peripheral lymphatic glands; the lower cervical glands were very deeply congested.

Abdomen:

Omentum.—The ventral surface of the omentum showed numerous lenticular caseating nodules, up to about 2 millimetres in diameter; the lymphatic fringes were congested and slightly hypertrophied.

Spleen.—Was enlarged (weight 12 ozs.) and firm. On section the pulp was seen to be almost completely replaced by shot-sized caseating tubercles.

Liver.—Seemed a little enlarged; the surface had a purplish colour, with paler (fatty ?) areas; the substance was closely beset with grey tubercles, ranging in size from a point just visible to the eye to that of a pin's head; the tubercles were slightly opaque in the centre.

Portal Glands.—Were enlarged. The cortices showed grey patches, in which greyish white foci were seen (early caseation).

Gall Bladder.—Under the mucous membrane there were three or four shot-sized tubercles.

Kidneys.—Each kidney showed in the cortex numerous grey tubercles similar to those in the liver.

Suprarenal Bodies.—The left suprarenal body showed in the cortex a number of tiny grey foci.

The right suprarenal body was similarly affected.

Thorax :

Heart.—The pericardium on the aorta showed one pinhead-sized tubercle. Heart cavities filled with red blood clot ; on the endocardium of the right ventricle there were three or four minute pearly tubercles ; heart muscle normal.

Pleura.—Along the margins of the ribs the fringes in places were congested and slightly hypertrophied, and contained a few small tubercles.

On the pleural surface of the tendon of the diaphragm there were three or four small tubercles.

Lungs.—The lungs were extensively consolidated, the anterior lobes, the right middle lobe, and the greater part of the caudal lobes being dark red, heavy, and almost completely airless. The posterior and dorsal portions of the caudal lobes were congested, and showed patches of early consolidation. On section the bronchi in the solid lobes were filled with muco-pus ; the cut surfaces of the posterior parts of the caudal lobes exuded slightly frothy œdema fluid.

The tissue of the lungs was crowded almost as closely as possible with grey tubercles, ranging in size from a mere point to about 1 millimetre in diameter ; each tubercle had a minute yellow centre.

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged. On section the cortex was firm, grey, and permeated with a fine opaque yellow network ; the medullary zone was deeply congested, and showed discrete tubercles.

Other glands in the dorsal mediastinum, and the bronchial glands, were enlarged and similarly affected.

One infra-tracheal gland resembled the bronchial ; another was intensely congested, and showed early tuberculosis.

The trachea was filled with white froth ; in the mucous membrane there were numerous congested grey foci ; there were three or four small tubercles on the right vocal chord, and one on the laryngeal surface of the epiglottis.

The mucous membrane of the vault of the pharynx showed fairly numerous caseous tubercles.

Intestines.—Under the mucous membrane of the small intestine there were numerous pinhead-sized caseous tubercles ; they occurred under the mucous membrane as well as in Peyer's patches, and were extremely numerous in the ileum.

The lymphoid follicles of the large intestine appeared a little enlarged.

Mesenteric Glands, Gastric Glands, Colic Glands.—All contained small caseous tubercles.

Various Lymphatic Glands.

Coeliac Glands.—Were enlarged, and consisted of firm grey tissue, with opaque foci of caseation.

Ischiatic Glands, Gluteal Glands, Popliteal Glands, Precrural Glands, Pudic Glands, Iliac Glands, Ilio Sacral Glands, Lumbar Glands, Submaxillary Glands, Parotid Glands, Pharyngeal Glands, Axillary Glands, Right Prescapular Gland, Ventral Mediastinal Glands.—Were closely beset with caseating miliary tubercles.

All the hæmo-lymph glands contained caseous tubercles.

Udder.—There were two caseating tubercles in the mammary tissue.

Bladder, Eyes.—Normal.

Microscopical Examination.

Gall Bladder.—Tubercle bacilli numerous.

Colon.—Tubercle bacilli moderately numerous.

Right Suprarenal	A few tubercle bacilli.
Mamma - -	
Vocal Chord -	

CALF 252.

Subcutaneous Inoculation of culture derived from the original material of Virus B XIV.

Date—April 8th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 21 lbs. [Age—15 weeks.]

Died—May 16th, 1905. 38 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side on April 8th, 1905.

Eleven days later there was a firm tumour measuring 5 in. in length, 3 in. in breadth, and about 1 in. in greatest thickness ; the left prescapular gland was 3 in. in length ; a prepectoral gland was the size of a walnut.

On May 2nd, 1905, 24 days after inoculation, the tumour measured 6 by $3\frac{1}{2}$ in. in superficial area and over 1 in. in greatest thickness ; the prescapular gland measured $4\frac{1}{2}$ in. in long diameter ; the prepectoral gland was unchanged. On this date signs of illness were first observed ; the rate of respiration was a little increased in frequency, the coat was staring and the calf was obviously losing flesh. The course of the illness was then exactly similar to that in other calves inoculated with 50 milligrammes of culture ; the respirations increased in frequency and finally became very laboured, and the calf gradually lost flesh and strength. It died on May 16th, 1905, 35 days after inoculation.

Weights.

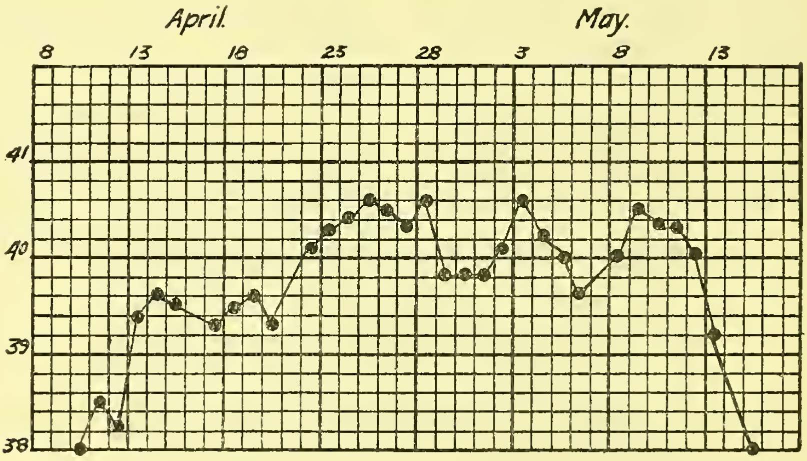
There was a steady decline in weight.

	qrs.	lbs.
April 11th, 1905 - - - - -	3	21
April 25th, 1905 - - - - -	3	14
May 2nd, 1905 - - - - -	3	11
May 10th, 1905 - - - - -	3	5
May 16th, 1905 - - - - -	2	21

Loss in weight.—28 lbs.

Rate of loss per week.—5·6 lbs

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—On the left side of the neck there was a firm tumour which measured 5 in. by $3\frac{1}{2}$ in. by $1\frac{1}{4}$ in. (in greatest thickness), and weighed with skin and muscles $10\frac{1}{2}$ ozs. On section the tumour had a lenticular outline (plano-convex), and showed a central core, $\frac{5}{8}$ in. in greatest thickness, of yellow caseo-necrotic tissue, containing in the upper part a series of little spaces, filled with clear serous fluid. The skin and muscles were thoroughly adherent to the caseated mass, and infiltrated to a slight extent with yellow caseous tubercles ; the skin was very thickened.

Left Prescapular Gland.—Measured 4 in. by $2\frac{1}{2}$ in. by $1\frac{1}{4}$ in., and weighed 5 ozs. On section the greater part of the cortex consisted of dense yellow caseated tissue, slightly gritty from calcification ; the rest of the cortex was composed of pinkish translucent tissue, with yellow foci of necrosis.

Left Prepectoral Glands.—The spherical prepectoral gland the size of a walnut, was hard, dense, yellow, and caseous throughout ; the cut surface showed a few whitish streaks which suggested beginning calcification. The kidney-shaped prepectoral, the size of a broad bean, showed an irregular yellow patch of caseation in the cortex, and in the rest of the gland reddish tissue studded with greyish white tubercles. A smaller deeper gland showed discrete tubercles and a patch or two of caseation.

Cervical Glands.—A mid cervical gland on the left side, the size of a kidney bean, was indurated and irregularly caseated. Other cervical glands contained small discrete tubercles.

Abdomen :

Omentum.—The inferior surface was congested, and showed a small number of flattened caseating tubercles up to about 2 millimetres in diameter.

Parietal Peritoneum.—Normal.

Spleen.—Was a little enlarged (weight 11 ozs.). On section the pulp was dark red, soft, and crowded with caseating tubercles, the largest about 2 millimetres in diameter.

Liver.—Was firm, dark in colour, and contained very numerous grey tubercles, ranging in size from a point just visible to the eye to about 1·5 millimetres in diameter (majority about 1 millimetre).

Gall Bladder.—On the mucous surface there were a few erosions covered with little masses of bile-stained mucus.

Portal Glands.—Were only slightly enlarged ; the larger ones showed irregular patches of grey translucent tissue, containing a few minute yellowish white foci ; the smaller glands showed discrete tubercles.

Kidneys :

Left.—In the cortex, on the surface as well as in the depth there were numerous grey tubercles ranging in size from a mere point to about 1·5 millimetres in diameter ; only a few of the larger ones showed central necrosis.

Right.—The right kidney contained similar tubercles.

Suprarenals.—The left suprarenal body showed in the cortex half a dozen grey tubercles the size of mustard seeds.

In the right suprarenal there were two similar tubercles.

Thorax :

Heart.—On the pericardium covering the aorta there were some velvety red vegetations, in which minute grey tubercles were seen ; on the surface of the left ventricle there was a flattened grey tubercle. Muscle substance and endocardium were normal.

Pleura.—The fringes along the margins of the ribs were congested and slightly hypertrophied in places; they contained minute grey granules, and here and there small flattened nodules up to 2 millimetres in diameter.

The pleural surface of the diaphragm showed two or three small nodules. On the ventral mediastinal fold of pleura there was a development of dark red velvety vegetations, in which minute grey granules were seen.

Lungs.—The right cephalic lobe was dark red in colour, and quite devoid of air. The right middle and left cephalic lobes were similar, with the exception of a few emphysematous lobules around the margins. The left caudal lobe was extensively consolidated, particularly in the antero-ventral parts; in the posterior portions there were large irregular patches. The right caudal lobe was congested, and showed consolidation of isolated lobules. The lung tissue was closely beset with grey tubercles, ranging from about 0·5 to 1·5 millimetre in dimeter; the tubercles showed only a slight amount of central necrosis. The bronchi in the anterior lobes were filled with muco-pus.

Mediastinal Glands.—The dorsal mediastinal glands were moderately enlarged; the cortices were closely beset with grey tubercles, which had in many places become confluent; only a few of the tubercles showed central necrosis.

The bronchial and infra-tracheal glands were similarly affected.

Tonsils.—The crypts were filled with yellow secretion; one or two small tubercles were seen in each.

Pharynx.—There were several pin-head caseating tubercles in the corruguated mucous membrane of the vault of the pharynx and on the posterior part of the septum nasi.

Trachea.—The mucous membrane of the trachea showed congested slightly raised grey tubercles scattered sparsely throughout its whole length.

Small Intestine.—A few congested grey tubercles were seen in the long Peyer's patch.

Large Intestine.—Appeared normal.

Various Lymphatic Glands:

Cœliac.—One cœliac gland was slightly enlarged, firmer than normal, and showed very early foci of necrosis; others contained a few discrete tubercles.

Renal, Lumbar.—The renal gland and the lumbar glands contained groups of confluent grey tubercles, with a few yellow foci of necrosis.

Ischiatic, Gluteal, Popliteal, Precrural, Pudic, Iliac, Sacro-Iliac, Axillary, Right Prescapular, Right Prepectoral, Parotid, Submaxillary, Retropharyngeal. Ventral Mediastinal.—Contained discrete grey caseating tubercles up to 2 millimetres in diameter; many of the tubercles showed only a slight amount of central necrosis.

Gastric, and Mesenteric Glands.—Were not enlarged; they contained grey tubercles in small number.

One or two of the *colic glands* also showed suspicious foci.

Some of the hæmo-lymph glands contained grey tubercles.

Testicles, Eyes.—Normal.

Microscopical Examination.

Tonsil (tubercle).—Numerous tubercle bacilli.

Suprarenal Body.—A few tubercle bacilli.

VIRUS B XV.

November 14, 1904.

MESENTERIC AND MEDIASTINAL GLANDS.

A mesenteric and mediastinal gland were sent. They came from a young cow which had, in addition, a small patch of tubercle in the right lung. The mediastinal glands were not enlarged, but contained scattered yellow tubercles. The mesenteric gland showed in the centre a large irregular yellow mass and a few scattered tubercles.

VIRUS B XV.

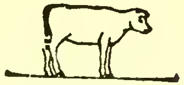
(November 14th, 1904.)

MEDIASTINAL GLAND.

CULTURE INOCULATIONS.

Inoculated on May 3rd, 1905, with Culture derived from the original material.

The Culture used was the 9th generation, 21 days old, and had been in cultivation for a total period of 170 days.



CALF 270.

Subcutaneous.

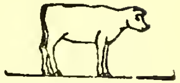
Dose : 50 mg.

Killed, June 19th, 1905 (47 days).

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
284	0·1 mg.	Intravenous	D. 19 days	G.T.
288	1·0 mg.	Intraperitoneal	D. 13 days	G.T.
289	1·0 mg.	Intraperitoneal	D. 65 days	G.T.
285	0·1 mg.	Intraperitoneal	D. 109 days	G.T.
287	1·0 mg.	Subcutaneous	D. 69 days	G.T.
290	1·0 mg.	Subcutaneous	D. 58 days	G.T.
286	0·1 mg.	Subcutaneous	D. 68 days	G.T.



CALF 278.

Subcutaneous.

Dose : 50 mg.

Died, June 13th, 1905 (41 days).

P.M.—General tuberculosis.

CALF 270.

Subcutaneous Inoculation of culture derived from the original material of Virus B. XV

Date—May 3rd, 1905.

Dose—50 milligrammes.

Age—8 weeks.

Killed—June 19th, 1905. 47 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on May 3rd, 1905.

Seven days later there was a flat subcutaneous thickening 4 in. by 3 in. ; the left prescapular gland measured 3 in. in length ; a prepectoral gland was the size of a Barcelona nut. On May 19th, 1905, 16 days after inoculation, the tumour and the prescapular gland attained their maximum size ; the former measured 5 in. by 3½ in. in superficial area and about 1 in. in thickness; the latter measured 4 in. in length.

On May 25th, 1905, 22 days after inoculation, the respirations became slightly increased in frequency; except for the respiratory trouble there was no change in the general condition for some time.

On June 12th, 1905, the respirations were more frequent (65 per minute), short and jerky, and the calf appeared to be losing flesh ; it lay on the floor most of the day, but was able to get up and walk about ; the appetite was poor.

The calf gradually got worse and became very thin ; it was killed when very ill on June 19th, 1905, 47 days after inoculation.

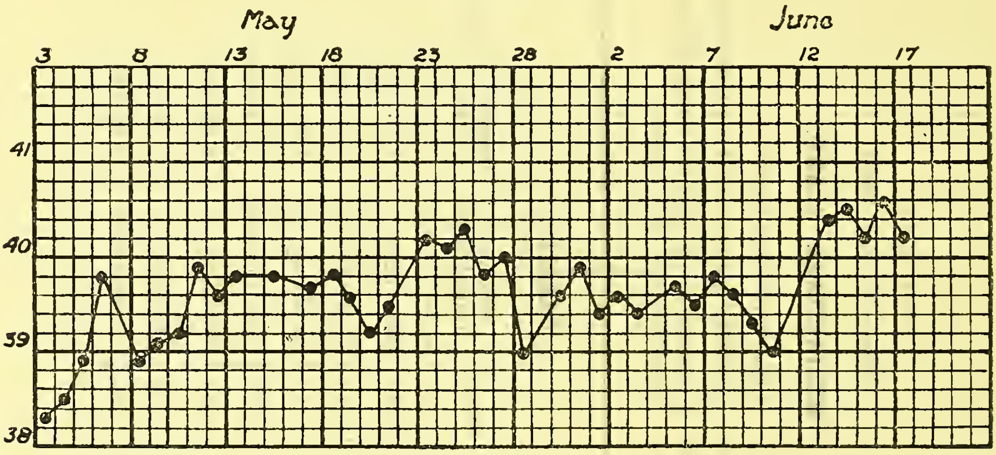
Weights.

The calf was apparently not weighed until May 18th, 15 days after it was inoculated. It showed at first a slight increase in weight and then a steady decline.

	cwt.	qrs.	lbs.
May 18th, 1905 - - - -	0	3	16
June 6th, 1905 - - - -	1	0	0
June 19th, 1905 - - - -	0	2	25

Loss in weight during last 13 *days.*—31 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—On the left side of the neck there was a firm tumour, measuring 4½ in. by 3½ in. by 1⅓ in., and weighing, with skin and infiltrated muscles, 10 ozs. On section between the skin and muscles there was a lenticular mass of yellow caseo-necrotic tissue, showing in the centre a series of small spaces filled with clear serous fluid; the muscles for a depth of half an inch were fibroid and beset with irregular caseous tubercles and nodules ; the skin was thoroughly adherent, but only slightly infiltrated.

Left Prescapular Gland.—Weighed 4 ozs., and measured 3½ in. by 2¾ in. by 2 in. On section the greater part of the gland was composed of dense pinkish yellow caseated tissue sprinkled with minute calcareous foci. A patch of medulla in the upper extremity was œdematous and free from tubercles ; a small part of the cortex at that extremity showed discrete caseating tubercles.

Left Prepectoral Glands.—The left spherical prepectoral, the size of a walnut, was dense yellow and caseous throughout ; a caseous lymphatic vessel, the thickness of a crow-quill, could be traced from the lower extremity of the local tumour to this gland. The left kidney-shaped prepectoral was enlarged, and beset with firm caseous nodules, ranging from 1 up to 2 or 3 millimetres in diameter ; two glands near the latter contained similar nodules.

Right Prescapular Gland, Right Prepectoral Glands.—Contained numerous caseating nodules.

Cervical Glands.—The lower and mid-cervical glands on the left side were enlarged, indurated and caseating ; the left upper and right cervical contained numerous caseating nodules.

Just within the entrance to the thorax, on the left side, there was a large hard gland, 1½ in. by 1¼ in. by 1 in., resembling on section the rounded prepectoral. The corresponding gland on the opposite side was enlarged, and closely beset with caseating nodules.

Abdomen :

Omentum.—On the inferior surface there were numerous small grey granules and scattered lenticular nodules, the largest the size of a wheat grain. The latter were yellow in the centre, and one or two were hæmorrhagic around the periphery.

Parietal peritoneum.—Normal.

Spleen.—Weighed 10 ozs. On the concave surface there were two shot-sized translucent tubercles, and in the pulp very numerous spherical tubercles with caseous centres and grey margins, ranging in size from about 1 to 2 millimetres in diameter (majority about 1·5 millimetre).

Liver.—Showed on the anterior surface a moderate number of flattened slightly raised nodules, many with overhanging margins, ranging up to about 3 millimetres in diameter ; there were besides scattered minute grey tubercles, just visible to the naked eye. The nodules were yellow and caseous in the centre, grey around the margins. There were similar nodules on the concave surface, but these had a more rounded outline. In the deeper parts of the liver tubercles were very sparsely distributed, many transverse sections revealing at most two or three tubercles; they ranged in size from a mere point to that of a millet seed.

Gall Bladder.—Showed half a dozen yellow caseous miliary tubercles under the mucous membrane.

Portal Glands.—Were considerably enlarged, and weighed together 3 ozs. On section the cortex of each was composed throughout of firm grey tissue, containing irregular yellow caseous patches and foci.

Kidneys.—The left kidney showed on the surface about ten grey caseating tubercles, the largest the size of a millet seed. On section one or two tubercles were seen deeper in the cortex.

The right kidney contained rather more numerous tubercles (twenty-four were counted on the surface), several being twice the size of a millet seed.

Suprarenal Bodies.—The left suprarenal body showed in the cortex two pinhead-sized greyish white tubercles.

The right suprarenal body appeared normal.

Thorax:

Heart.—Normal.

Pleura.—There was a small amount of yellow serous fluid in the pleural cavities; the fringes along the margins of the ribs on the left side showed numerous small grey tubercles, many arranged in little clusters. Near the sternum on this side were two small flattened nodules with yellow centres; on the right side the fringes contained similar tubercles to those on the left; those along the last few ribs were very numerous, and formed continuous rows of flattened tuberculous granulations.

On the pleural surface of the diaphragm on the right side there were patches of similar vegetations; there was also a firm greyish pink mushroomed growth 1 centimetre in diameter, showing on section yellow necrotic foci. On the left side of the diaphragm the pleura showed congested villous tufts containing small groups of tubercles.

Lungs.—The left cephalic lobe was, with the exception of a few lobules along the dorsal border, dark red, firm, and quite airless. The surface was studded with numerous slightly projecting grey nodules, the largest about 2 millimetres in diameter opaque and yellow in the centre. In several places the nodules were confluent, forming little groups; similar nodules were seen on section. The left caudal lobe was beset with similar nodules, also in many places confluent. There were no large areas of consolidation, each nodule or group of nodules being surrounded by irregular dark red zones of congestion. Several lobules in various parts of this lobe were firm, red (some dark red, as if from recent haemorrhage), and showed on section early foci of necrosis.

The right cephalic, right middle and antero-ventral portions of the right caudal showed large irregular dark red areas of consolidation, sharply demarcated from the air-containing lobules. In the caudal lobe there were several solid lobules similar to those in the left caudal; the right lobes were everywhere closely beset with nodules resembling those in the left cephalic. Around the margins of the caudal lobes there were numerous tubercles in the fringes.

Bronchial Glands, Mediastinal Glands.—Were greatly enlarged, weighing together about 7 ozs.; the long caudal gland measured four and a half inches in length. On section they were composed throughout of firm grey translucent tissue, surrounding numerous irregular yellow patches and foci of caseation.

The peribronchial glands and one tracheal gland resembled the mediastinal. Two small tracheal glands, the ventral mediastinal glands and a gland in the caval fold of pleura, were packed with caseating nodules.

Tonsils.—Each tonsil contained two or three caseating nodules, about 2 millimetres in diameter. There were also two or three in the corrugated mucous membrane in the vault of the pharynx; otherwise the pharyngeal mucous membrane was normal.

Tongue.—A few of the follicles at the base of the tongue were enlarged and caseating.

Larynx.—Normal.

Trachea.—The mucous membrane of the trachea showed a few congested caseating foci.

Small Intestine.—Was exceptionally closely beset with caseous tubercles, ranging in size from a pin's head to a large shot; they were situated under the mucous membrane as well as in Peyer's patches. The mucous membrane which covered them was congested and slightly raised; the tubercles were most numerous in the lower part.

Large Intestine.—Practically all the lymphoid follicles in the large intestine were enlarged, congested on the mucous surface, and caseous in the centre.

Mesenteric Glands.—Were enormously enlarged, and weighed with the mesentery in which they lay $1\frac{1}{2}$ lbs. One of the glands in the middle of the mesentery measured $4\frac{1}{2}$ in. by 2 in. by $\frac{3}{4}$ in. On section they closely resembled the mediastinal glands, but were not quite so advanced in caseation.

Gastric Glands, Colic Glands.—Were enlarged, and closely beset with confluent caseating nodules.

Urinary Bladder, Eyes, Thyroid Body.—Normal.

Various Lymphatic Glands:—

Cœliac Glands.—One cœliac gland was much enlarged and on section resembled the portal; other cœliac glands were beset with coalescing caseating nodules.

Renal, Lumbar.—Were enlarged, and showed nodular masses of firm grey translucent tissue, well advanced in caseation.

Precrural, Popliteal, Gluteal, Ischiatic, Iliac, Ilio-Sacral, Parotid, Mastoid, Submaxillary, Pharyngeal.—Were enlarged, and packed with firm yellow caseous nodules, ranging in size up to 2·5 millimetres in diameter. They were irregular in outline, and for the most part remained discrete, but in some of the glands they had in many places become confluent. The ischiatic glands were unusually large, being equal in size to the gluteal.

Vertebral, Oesophageal.—Contained numerous caseous tubercles.

All the hæmolymph glands in various parts of the body contained miliary caseous tubercles.

Microscopical Examination.

Tongue (follicle.)—Moderately numerous tubercle bacilli

CALF 278.

Subcutaneous Inoculation of culture derived from the original material of Virus B XV.

Date—May 3rd, 1905.

Dose—50 milligrammes.

Age—8 weeks.

Died—June 13th, 1905. 41 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on May 3rd, 1905.

Seven days later there was an elongated slightly raised swelling measuring 4½ in. in length by 2½ in. in breadth, the left prescapular gland measured about 2½in. in length ; a prepectoral gland was slightly enlarged.

On May 19th, 1905, 16 days after inoculation, the tumour measured 6 in. in length by 3 in. in breadth and appeared to be softening in the upper part ; the left prescapular gland was 4 in. in length ; the prepectoral gland was the size of a walnut ; there was slight œdema of the dewlap. The tumour increased still further in size and gradually became converted into a thin-walled fluctuating cyst; towards the end of the experiment an opening appeared in the skin over the upper part of the tumour and through this most of the contents (serous fluid) of the cyst were discharged.

Signs of illness were first noticed on May 25th, 1905, 22 days after inoculation ; the coat was rough, the respirations were slightly increased in frequency and the calf appeared to be losing flesh.

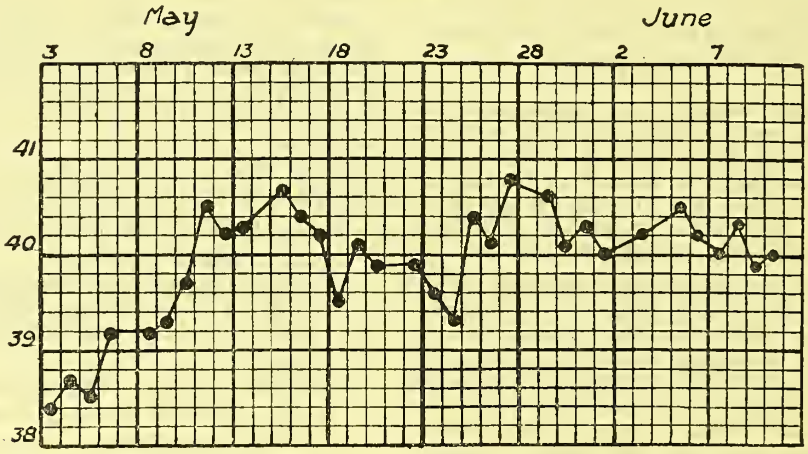
The illness gradually became more acute ; the respirations became more and more frequent (70 per minute) and were finally very laboured ; the appetite diminished and the calf lost flesh and strength. On June 12th it was too weak to stand up, and on June 13th, 1905, 41 days after inoculation, it died.

Weights.

	qrs.	lbs.
May 18th, 1905 - - - -	2	16
May 25th, 1905 - - - -	2	21
June 13th, 1905 - - - -	2	8

Loss in weight from May 18th to June 13th.—8 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Greatly emaciated.

Seat of Inoculation.—The local tumour on the left side of the neck was almost completely converted into a thin-walled cyst ; the cyst was collapsed, most of the contents having been discharged through an irregular opening in the skin near the upper extremity. On section the cyst was found to contain a small quantity of turbid watery fluid. The walls of the cyst were formed externally by skin, which over the greater part of the tumour was infiltrated with caseous deposit throughout almost the whole of its thickness, and internally by muscular tissue, studded for a short distance with caseous tubercles ; the walls were lined internally with soft caseo-necrotic tissue, varying in thickness, in several places projecting into the cavity as irregular shaggy masses. At the lower extremity of the tumour there was a triangular mass one and three-quarter inches in length and three-quarters of an inch in greatest thickness, of dense yellow caseo-necrotic tissue. The total length of the tumour was about six inches, and the greatest breadth four inches.

Left Prescapular Gland was triangular in transverse section, weighed 6 ozs., and measured 4 in. by 2 in. by 2 in. On section it consisted practically throughout of dense yellow caseated tissue ; there was a small patch in the middle of the gland of fibroid tissue, studded with caseous tubercles.

Left Prepectoral Glands.—The spherical prepectoral gland the size of a walnut, was caseous throughout ; a smaller gland nearer the thorax was similar on section. Just under the first rib there was a gland the size of a marble, two-thirds of the substance of which was composed of grey caseating tissue. The latter three glands formed a chain extending from the inferior extremity of the local tumour to the entrance to the thorax.

The kidney-shaped prepectoral gland (lying on the first rib) was enlarged, œdematous, and congested ; it showed in the cortex irregular caseous nodules and numerous minute greyish white foci.

Cervical Glands.—Left lower cervical described above. Other cervical glands contained irregular caseous tubercles and minute caseous foci ; many of the latter in little groups.

Abdomen :

Omentum.—Showed on its inferior surface a small number of tubercles, the largest the size of a millet seed ; the connective tissue fringes were deeply congested.

Parietal Peritoneum.—Normal.

Spleen.—Was enormously enlarged ; it weighed one and a half pounds, and measured fourteen and a half inches in length. The pulp was firm, and closely crowded with nodules, ranging up to 3 millimetres or more in diameter ; the nodules had in several places coalesced, and practically all showed an angular outline, caused by pressure against their neighbours ; they were yellow and necrotic in the centre, reddish grey around the margins.

Liver.—Was purplish in colour, and closely beset with grey tubercles, ranging in size from a mere point up to about 1 millimetre in diameter; only the larger ones showed definite central necrosis.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged, and showed throughout the cortices irregular masses of grey translucent tissue studded with yellowish white streaks and foci of caseation.

Kidneys.—The left kidney was pale, and showed on the surface a network of fine greyish tissue. On section the cortex showed numerous pale radial striae (degenerated tubules?). The cortex contained fairly numerous grey tubercles, the largest about the size of a millet seed, the smallest barely visible. The tubercles showed very little central necrosis.

The right kidney contained similar tubercles; a fine network was seen on the surface, but was not so well marked as in the left kidney.

Suprarenals.—The right suprarenal body contained a small grey tubercle with a minute opaque focus in the centre.

There was a similar tubercle in the left suprarenal.

Thorax:

Heart.—Normal.

There was a small amount of yellow serous fluid in the pleural cavities.

Pleura.—Along the anterior margins of most of the ribs on the left side, were narrow lines of reddish connective tissue, containing minute grey granules; these began near the vertebrae, and in no case extended ventrally beyond the middle of a rib, most of them being only a few inches in length.

On the right side there were a few congested villous tufts only. There was one flattened caseating tubercle on the costal cartilage of the ninth rib.

There were some reddish vegetations on the caval and mediastinal folds of pleura, and on the pleural surface of the pericardium.

Lungs.—The lung tissue was closely beset with opaque grey tubercles, the largest about 1 millimetre in diameter; these had in many places coalesced, and had formed irregular grey patches studded with yellow foci. The greater portions of the small anterior lobes and the antero-ventral portions of the caudal lobes were purplish red in colour and practically completely airless; the rest of the caudal lobes were congested, and mottled with patches of consolidation surrounding groups of tubercles; these patches were not sharply marked off from the air-containing tissue; the bronchi in the solid portions contained muco-pus.

Bronchial Glands, Mediastinal Glands.—Were moderately enlarged, weighing together a little over 2 ozs.

On section they showed in the cortex grey, sometimes greyish red, translucent tissue, permeated with a fine yellow network; the central portions of the gland were soft and deeply congested.

The peribronchial and infratracheal glands resembled the mediastinal.

Tonsils.—Contained each one or two caseous tubercles.

Pharynx.—The pharyngeal mucous membrane was congested; no tubercles were seen.

Tongue.—The mucous membrane on the left side showed several shallow ulcers with uneven margins; on the right side there was an ulcer with a caseous base.

Larynx.—On each vocal chord there was a flattened caseating nodule about 2 millimetres in length.

Trachea.—The mucous membrane of the trachea showed sparsely scattered caseous tubercles, each surrounded by a zone of deep congestion.

Intestines.—The small intestine showed sparsely scattered caseous tubercles, the largest the size of a pin's head.

The large intestine was normal.

Mesenteric Glands.—Most of the mesenteric glands appeared normal; a few contained caseating tubercles; those at the anterior extremity showed also groups of caseous foci.

Gastric Glands.—Two or three gastric glands contained caseating foci in the cortex; others were normal.

Colic Glands.—A few of the colic glands contained discrete caseous foci.

Various Lymphatic Glands:

Cœliac.—One, the largest, was composed throughout of firm translucent tissue permeated with a fine yellow network; other glands contained numerous irregular caseating foci.

Renal, Lumbar.—Were closely beset with caseating nodules.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic, Submaxillary, Parotid, Retropharyngeal, Axillary, Right Prescapular, Right Prepectoral, Ventral Mediastinal.—Contained numerous caseating foci, ranging up to 2 and 3 millimetres in diameter; the foci were irregular in outline, and in the great majority of cases small, being often arranged in little groups.

Iliac, Ilio-Sacral.—Contained caseating foci in small number.

All the hæmo-lymph glands contained caseating tubercles.

Udder.—In one of the quarters was a shot-sized caseous tubercle.

Urinary Bladder, Eyes, Thyroid Body.—Normal.

Microscopical Examination.

Tongue }
Mamma } Moderately numerous tubercle bacilli.

VIRUS B XVI.

December 20, 1904.

MEDIASTINAL GLAND.

A young fattened cow, when killed, was found to have bronchial and mediastinal glands affected and no sign of tubercle elsewhere. The specimens sent were (1) a large mediastinal gland which contained a hard fibroid and highly calcareous nodule, and (2) a small gland which had a few discrete very chronic tubercles.

VIRUS B XVI

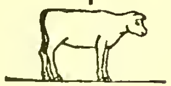
(December 20th, 1904.)

MEDIASTINAL GLAND.

Culture Inoculations.

Inoculated on May 12th, 1905, with Culture derived from the original material.

The Culture used was the 8th generation, 21 days old, and had been in cultivation for a total period of 163 days.



CALF 294.

Subcutaneous.

Dose : 50 mg.

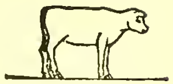
Killed when ill, June 27th, 1905,

(46 days).

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
296	0·1 mg.	Intravenous	D. 24 days	G.T.
299	1·0 mg.	Intraperitoneal	D. 26 days	G.T.
300	1·0 mg.	Intraperitoneal	D. 74 days	G.T.
295	0·1 mg.	Intraperitoneal	D. 27 days	G.T.
298	1·0 mg.	Subcutaneous	D. 52 days	G.T.
297	0·1 mg.	Subcutaneous	D. 101 days	G.T.



CALF 296.

Subcutaneous.

Dose : 50 mg.

Died, June 13th, 1905,

(32 days).

P.M.—General tuberculosis.

CALF 294.

Subcutaneous Inoculation of culture derived from the original material of Virus B XVI.

Date—May 12th, 1905.

Dose—50 milligrammes.

Weight—3 qrs. 10 lbs. [Age—8 weeks.]

Killed—When ill. June 27th, 1905. 46 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on May 12th, 1905.

Seven days later there was a flat subcutaneous thickening 3 in. by 2½ in.; the left prescapular gland was slightly enlarged.

The tumour slowly increased in size; on June 12th, 1905, it was hard and measured 5 in. by 3½ in. in superficial area and more than 1 in. in thickness: the left prescapular gland was uniformly indurated and measured about 4in. in length; there was no change in the general condition.

On June 21st, 1905, 40 days after inoculation, the temperature rose to 40·9° C. and the respirations were distinctly increased in frequency.

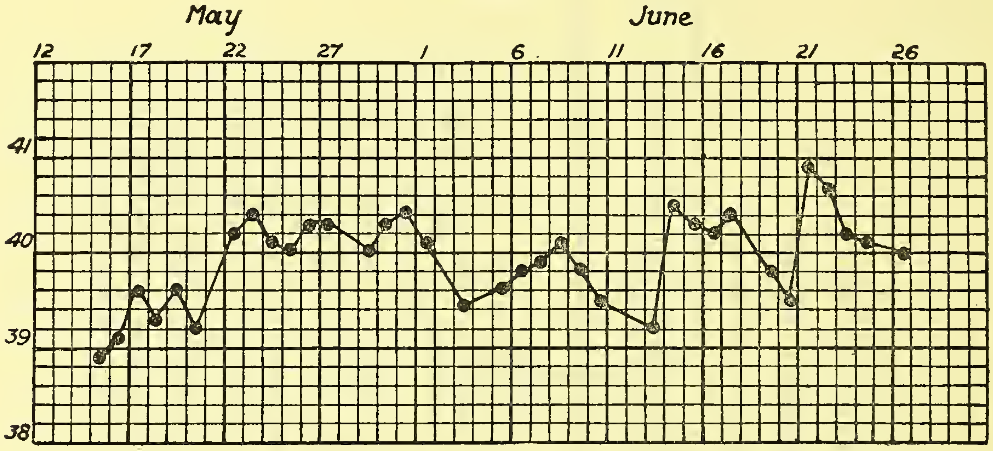
The calf then gradually got worse and began to lose flesh: it was killed, when ill but not dying, on June 27th. 1905, 46 days after inoculation.

Weights.

	qrs.	lbs.
May 18th, 1905 - - - - -	3	10
May 23rd, 1905 - - - - -	3	16
June 14th, 1905 - - - - -	3	12
June 27th, 1905 - - - - -	3	7

Loss in Weight.—3 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Slightly emaciated.

Local Lesion.—On the left side of the neck there was a firm tumour, measuring 5 in. by 3½ in. by 1½ in. This on section was seen to consist of three layers; the external one of greatly thickened skin, beset with small yellow congested tubercles; the middle one of pinkish yellow necrotic tissue showing small spaces in the upper part; the internal one of fibroid muscular tissue, closely studded with irregular yellow caseous tubercles. Each of the three layers was about ½ in. in greatest thickness.

There was a moderate amount of gelatinous œdema fluid in the tissues around the lower extremity of the tumour.

Left Prescapular Gland.—Weighed 3 ozs., and measured 3 in. by 2 in. by 1½ in. On section the greater part of the cortex was composed of dense pinkish yellow caseated tissue, the rest of firm translucent tissue, mottled with irregular caseous patches; the capsule of the gland was thickened.

Right Prescapular Gland.—Contained four caseating nodules

Prepectoral Glands.—On the left side the spherical prepectoral gland was the size of a Barcelona nut, and showed on section part of the cortex grey and translucent, and beset with minute yellow foci. The kidney-shaped gland was enlarged, œdematous, and showed minute greyish yellow points throughout the cortex; a third small gland contained a few foci at one extremity.

The glands on the right side appeared normal.

Cervical Glands.—The left upper cervical gland was indurated and caseating in more than half its extent; a left mid cervical gland, the size of a kidney bean, was caseous throughout; a left lower cervical showed a caseating mass affecting half its substance. On the right side the upper cervical contained about half a dozen nodules, the largest the size of a pea; a mid cervical, the size of a kidney bean, was composed throughout of grey caseating tissue; a right lower cervical resembled the corresponding one on the opposite side.

Just within the entrance to the thorax, on the left side, was a hard gland the size of a pheasant's egg, composed throughout of dense tissue, partly uniformly pinkish yellow, and partly translucent and fibroid, and beset with minute yellow foci.

Abdomen:

Omentum.—On the inferior surface of the omentum there were a few flattened nodules, yellow in the centre, the largest 5 millimetres in diameter. There were also several smaller translucent tubercles, the largest the size of a millet seed.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 8 ozs. Showed on the surface, under the capsule, numerous rounded projections, yellow in the centre. On section the pulp contained moderately numerous firm yellow nodules, ranging in size up to about 5 millimetres in diameter; the nodules were somewhat irregular in outline and many were softened in the centre.

Liver.—Showed on the surface moderately numerous greyish nodules, with yellow necrotic centres, ranging in size from about 1 to 5 millimetres in diameter; many of these were raised above the surface and flattened; others were situated just under the capsule, or were dimly seen in the depth of the liver substance. On section numerous similar nodules, the largest about 2 millimetres in diameter, were seen evenly distributed throughout the substance.

Portal Glands.—Were considerably enlarged. On section the cortices were composed of grey translucent tissue, mottled with irregular yellow patches and foci of caseation.

Gall Bladder.—Normal.

Left Kidney.—On the surface four nodules, ranging from 1 to 2 millimetres in diameter, were seen; these were grey, translucent, and showed a small amount of central necrosis. Deeper in the cortex were four similar nodules.

Right Kidney.—The eortex showed eight nodules, three under the capsule and five in the depth; one of the latter measured 5 millimetres in diameter. Besides the nodules several minute grey foci were seen.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Normal.

Pleura.—On the left side of the chest were about a dozen flattened grey nodules, slightly yellow in the centre, the largest about 3 millimetres in diameter. On the right side anteriorly there were four similar nodules. The pleura covering the diaphragm showed a cluster of half a dozen small tubercles near the orifice for the vena cava.

Lungs.—The right cephalic lobe was firm, heavy, dark red and quite airless; in the left cephalic lobe the lower half of the ventral flap was in a similar condition; in the rest of the lobes there were irregular dark red consolidated patches, either affecting whole lobules, or surrounding single nodules or small groups of nodules. The lung tissue contained moderately numerous nodules, ranging in size from a small shot to a large pea; the nodules had grey margins and irregular yellow caseous centres; in the consolidated lobes the nodules under the pleura projected above the general surface. In various parts of the lung irregular hard masses were felt; these on section had a lobular outline, and consisted of greyish red translucent tissue infiltrated with yellow necrotic foci, forming in some cases a network. In the right cephalic lobe the consolidated tissue around the nodules showed minute greyish foci, and appeared to be in an early stage of general tuberculous infiltration.

Thoracic Glands. — The bronchial glands and mediastinal glands were moderately enlarged, and showed the cortices mottled with small opaque yellow patches, forming in places a coarse network; the medulla of each gland was soft and deeply congested.

The peribronchial glands and an infratracheal gland were in a similar condition; a second infratracheal gland was beset with caseating nodules.

Tonsils.—The tonsils contained each a few caseous odules.

Pharynx and Larynx.—Normal.

Tongue.—There was one small caseous ulcer on the ight side of the tongue and two at the base.

Trachea.—The mucous membrane showed two ulcer-ted foci with congested margins.

Small Intestine.—In the lower part of the intestine were fairly numerous caseous nodules, ranging in size from a millet seed to that of a wheat grain. They were situated chiefly in Peyer's patches, but occurred also under the mucous membrane; the larger nodules were softened, and the mucous membrane over them showed a small opening, through which the soft caseous material could be squeezed. In the upper part of the intestine there were similar nodules very sparsely distributed.

Large Intestine.—Most of the lymphoid follicles were caseous and congested on the mucous surface.

Mesenteric Glands.—All the mesenteric glands presented nodular enlargements, largest and most numerous towards the posterior extremity of the mesentery. These on section were irregular in outline, and showed greyish red translucent tissue, surrounding yellow caseous foci.

Ileo-Colic Glands.—Were much enlarged, and were composed almost throughout of firm translucent tissue, infiltrated with caseous foci.

Gastric Glands, Colic Glands.—Were enlarged; the majority were almost entirely composed of tuberculous tissue in a state of early caseation; the rest contained caseating nodules.

Bladder, Testicles, Eyes.—Normal.

Various Lymphatic Glands:

Cœliac.—Were enlarged, and resembled the portal.

Renal Gland.—Was packed with confluent caseating nodules.

Lumbar and Iliac Glands.—Contained each a few caseating nodules, the largest the size of a pea.

Left Precrural Gland.—Contained one caseating nodule, about 5 millimetres in diameter.

Right Precrural Gland.—Had a similar nodule.

Pudic Glands, Popliteal Glands, Gluteal Glands.—Contained caseating nodules, the largest 5 millimetres in diameter.

Submaxillary Glands.—Contained each a caseating mass, the size of a kidney bean, and several small nodules.

Pharyngeal Glands.—Were closely beset with caseating nodules, forming in places large confluent masses.

Parotid Glands.—Contained each half a dozen yellow caseous nodules, some of which were softened in the centre.

Left Axillary Gland.—Showed two caseating nodules, 5 millimetres in diameter.

Right Axillary Gland.—Was normal.

A hæmo-lymph gland in the right axilla contained two caseating nodules.

Microscopical Examination.

Ulcer on Tongue.—Numerous tubercle bacilli, many with dark stained granules.

Secretion from Tonsillar Crypt.—A few tubercle bacilli.

Small Intestine.—Numerous tubercle bacilli.

CALF 296.

Subcutaneous Inoculation of culture derived from the original material of Virus B. XVI.

Date—May 12th, 1905.

Dose—50 milligrammes.

Weight—2 qrs. 8 lbs. [Age—8 weeks.]

Died—June 13th, 1905. 32 days after inoculation

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on May 12th, 1905.

Seven days later there was a flat subcutaneous thickening 4 in. by 2 in.; the left prescapular gland measured 2½ in. in length. On May 25th, 1905, 13 days after inoculation, there was a slightly raised firm tumour 5 in. in length by 3½ in. in breadth; the prescapular gland measured 5 in. in length; the muscles between the tumour and gland were thickened and infiltrated, and there was some œdema of the dewlap; the coat was staring, otherwise there was no change in the general condition of the animal.

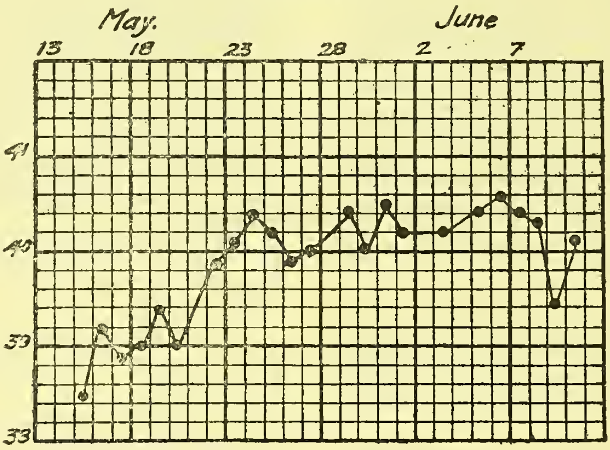
On June 2nd, 1905, 3 weeks after inoculation, the calf had become obviously ill, but there was not as yet any appreciable increase in the rate of respiration. Very soon, however, the calf began to breathe more quickly, and then the rate of respiration very speedily increased in frequency (on the day before the calf died the respirations were 80 per minute) and the calf rapidly lost flesh and strength. It died on June 13th, 1905, 32 days after inoculation.

Weights.

From May 18th, 1905, to June 6th, 1905 (19 days), there was a gain in weight of 5 lbs.; during the last week of life the calf lost 12 lbs.

		qrs.	lbs.
May 18th, 1905	- - - -	2	8
June 6th, 1905	- - - -	2	13
June 13th, 1905	- - - -	2	1

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—Considerably emaciated.

Local Lesion.—On the left side of the neck there was a slightly elevated firm flattened tumour, measuring 5 in. in length and 3 in. in breadth. On section this showed between the skin and muscles, and thoroughly adherent to them, a lenticular mass of yellow caseo-necrotic tissue, three-quarters of an inch in greatest thickness, showing in the middle of the upper part a series of little spaces, from which clear yellow fluid could be squeezed. The skin was thickened, and showed small yellow congested tubercles. The underlying muscles were fibroid, and closely beset for a depth of about a third of an inch with yellow caseous nodules.

Running in the muscles from the inferior extremity of the tumour to the nearest glands were several thick hard caseous cords.

Left Prescapular Gland.—Weighed 4 ozs., and measured 3½ in. by 1¾ in. by 1¾ in. (transverse section triangular in outline). On section the cortex was composed throughout of pinkish yellow caseated tissue; there was no calcification. In the centre of the gland there was a small patch of fibroid glandular tissue, studded with discrete yellow tubercles; the capsule was thickened.

Right Prescapular Gland.—Contained fairly numerous caseous tubercles, the largest about 1·5 millimetre in diameter.

Prepectoral Glands.—The left spherical prepectoral, 1·5 centimetre in diameter, was dense and caseous throughout. It was embedded in a mass of fibroid tissue, studded with yellow caseous nodules, which was continuous with one of the caseous cords mentioned above. The left kidney-shaped gland was indurated and much enlarged, and showed in the cortex an irregular caseated patch, and numerous discrete caseous foci.

The right spherical prepectoral gland contained a small caseating patch and a few discrete tubercles; the reniform gland contained numerous caseous tubercles, some very small.

Cervical Glands.—On the left side the upper cervical showed half its cortex composed of greyish red tissue in a state of caseation, and in the rest a few caseous tubercles. A lower cervical gland, the size of a filbert, was indurated and in a state of early caseation. A mid cervical gland was œdematous, and showed two or three caseous foci. On the right side the upper cervical gland contained discrete caseous tubercles; the rest minute caseous foci.

Abdomen:

Omentum.—On the inferior surface of the omentum there were a few tubercles, slightly opaque in the centre the largest the size of a millet seed.

Parietal Peritoneum.—Normal.

Spleen.—Weighed 6 ozs., and was normal on the surface. The pulp was soft, and contained a moderate number of spherical grey miliary tubercles, with yellow centres.

Liver.—The liver substance was peppered with grey tubercles, ranging in size from a mere point up to about 1 millimetre in diameter (majority about 0·5 millimetre); the larger tubercles were seen to be slightly opaque in the centre.

Gall Bladder.—Under the mucous membrane there was a minute yellow tubercle.

Portal Glands.—Were enlarged, and closely beset with confluent caseating tubercles.

Kidneys.—Each kidney showed in the cortex fairly numerous tubercles similar to those in the liver.

Suprarenal Bodies.—Appeared normal.

Thorax :

Heart.—Normal.

Pleura.—On the parietal pleura were a few very small congested villous tufts; on the pleural surface of the diaphragm there was a single softened tubercle.

Lungs.—The right cephalic and the right middle lobes were bluish black in colour, and almost completely airless. The right caudal lobe was mottled on the surface with irregular bluish black patches, which had joined together to form a network. In the left lobes the areas were not so numerous nor so large. The left cephalic lobe (ventral portion) was more severely affected than the left caudal. The lung tissue was closely and evenly beset with grey tubercles, opaque in the centre, the largest about 1 millimetre in diameter; here and there the tubercles showed a tendency to coalesce.

Thoracic Glands.—The bronchial and mediastinal glands were moderately enlarged, and showed the cortices composed of greyish red tissue, permeated with a fine yellow network; the medullary portions of the glands were deeply congested. The infratracheal and peribronchial glands were similarly affected.

The ventral mediastinal glands contained discrete caseous tubercles.

Alimentary Tract :

Tonsils.—Several crypts were filled with secretion; no tubercles were seen.

Pharynx.—In the corrugated mucous membrane in the vault there were one or two minute caseous tubercles; notubercles in other parts of the pharynx.

Tongue.—On the left side, near the base, was a yellow tubercle with a soft caseous centre (follicle ?).

Larynx.—Normal.

Trachea.—The mucous membrane in the anterior part showed three or four small grey tubercles with congested margins.

Intestines.—No tubercles were seen.

Gastric, Mesenteric, and Colic Glands.—Contained discrete caseating tubercles. The terminal mesenteric glands were most affected, and showed in addition to the tubercles numerous discrete caseous foci.

Various Lymphatic Glands :

Cœliac Glands.—One of the glands consisted of firm grey tissue, studded with caseous foci; the others contained small tubercles.

Lumbar Glands, Renal Glands.—Resembled the portal.

Precrural Glands.—Contained fairly numerous discrete caseous tubercles, irregular in outline, the largest about 1·5 millimetre in diameter.

Pudic, Popliteal, Gluteal, Ischiatic, Parotid, Submaxillary, Pharyngeal.—Contained similar tubercles, the largest in the majority of the glands being, however, not more than 1 millimetre in diameter.

Axillary, Iliac, Ilio-Sacral.—Showed only a small number of tubercles.

All the hæmo-lymph glands contained caseous tubercles.

Eyes, Thyroid Body, Mamma, Urinary Bladder.—Normal.

Microscopical Examination.

Gall Bladder - - - -}
Tongue Tubercle - - -} Numerous tubercle bacilli.

VIRUS B XVII.

January 9, 1905.

LUNG AND MEDIASTINAL GLANDS.

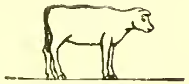
The specimens, mediastinal and bronchial glands and lung, were taken from a young fat cow. In the lung were two patches of tubercle. There were no tubercles in the bronchial glands. The patches in the lung were tuberculous and showed yellow patches of necrosis. In the mediastinal gland there were two nodules, filled with softened caseous material gritty from calcification, and numerous discrete yellow pea-sized calcareous nodules.

TABLE 17.

CULTURE INOCULATION.
VIRUS B XVII
(January 9, 1905.)
MEDIASTINAL GLAND.

Inoculated with culture obtained direct from the original material on April 13, 1905.

The culture was 20 days old, 6th generation, and had been in artificial cultivation for a period of 94 days.



CALF 258.

Subcutaneous.

Dose : 50 mg.

Died, May 1, 1905,

18 days after inoculation.

P. M. : E.^{3}.

Necrotic local lesion : acute miliary tuberculosis ; lungs extensively consolidated.

RABBITS.

No.	Dose.	Method.	Duration of Life.	Result.
260	0·1 mg.	Intrav.	18 days	G.T.
261	0·1 mg.	Intrap.	35 days	G.T.
262	1·0 mg.	Intrap.	19 days	G.T.
263	1·0 mg.	Intrap.	27 days	G.T.
264	1·0 mg.	Subcut.	67 days	G.T.
265	1·0 mg.	Subcut.	70 days	G.T.

CALF 258.

Subcutaneous Inoculation of culture derived from the original material of Virus B XVII.

Dose—50 milligrammes.

Date—April 13th, 1905.

Weight—April 19th, 1905. 2 qrs. 25 lbs. (Age, 10 weeks).

Died—May 1st, 1905. 18 days after inoculation.

Clinical History.

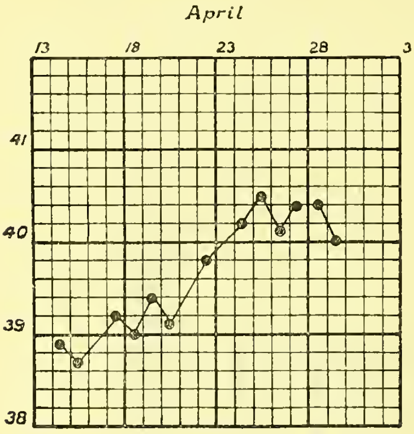
The calf was inoculated subcutaneously on the left side of the neck on April 13th, 1905.

Six days later there was a subcutaneous thickening, 3 in. by 2 in.; the prescapular gland on the same side was twice the normal in size.

The tumour increased and finally measured about 5 in. by 3½ in. by 1 in.; the prescapular gland measured about 3½ in. in long diameter.

On April 24th, 11 days after inoculation, the respirations were noticed to be increased and the animal looked ill. The illness rapidly became more acute; the respirations increased in frequency, and were finally very hurried and laboured; the calf became very thin and weak, and was found dead on the morning of May 1st, 1905, 18 days after inoculation.

Temperature.



Weights.

The Calf lost 16 lbs. in weight in 12 days.

April 19th, 1905 - - -	2 qrs. 25 lbs.
April 25th, 1905 - - -	2 qrs. 21 lbs.
May 1st, 1905 - - -	2 qrs. 9 lbs.
Rate of loss per week - -	9.3 lbs.

POST-MORTEM EXAMINATION.

Carcass.—Very emaciated.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a firm tumour 5 in. by 3¼ in. by a little over 1 in. in thickness; it was rounded externally, flattened on the internal surface; on section it consisted of deeply congested (especially around the peripheral parts) yellow necrotic tissue, showing signs of breaking down in the centre. The skin and superficial muscles were adherent and infiltrated for a short distance.

The Left Prescapular Gland.—Measured 3¼ in. by 1½ in. by 1¼ in, and weighed a little over 2 ozs. On section the cortex was composed throughout of firm pinkish-yellow caseated tissue; the medullary part was deeply congested and beset with minute discrete tubercles.

The Left Prepectoral Glands.—The spherical gland, the size of a large pea, was firmer than normal, engorged with blood, and showed small greyish-white points in the cortex.

A deeper, slightly larger gland showed minute discrete pearly-grey tubercles in the cortex.

Cervical Glands.—A left lower cervical gland, the size of a large filbert, was deeply congested and beset in the cortex with minute grey tubercles mostly in groups. Other cervical glands on the left side and all those on the right contained each a few minute grey tubercles.

Abdomen :

Omentum.—The connective tissue fringes on the inferior surface were deeply congested, and showed a small number of tubercles ranging in size from a point just visible to that of a millet seed. There was a small quantity of yellow serous fluid in the peritoneal sac.

Spleen weighed 6 ozs., and was normal on the surface; on section the pulp was dark red and of about normal firmness; close examination revealed some small spherical grey bodies scattered throughout which were probably early tubercles.

The Liver was slightly enlarged and showed a purplish yellow mottling on the surface; the substance was firm and closely peppered with minute grey tubercles, with opaque centres, mostly about 0·5 mm. in diameter.

Gall Bladder.—Under the mucous membrane there were a few minute whitish specks (?).

The Portal Glands.—Were enlarged and œdematous; the cortices were firmer and greyer than normal (as if infiltrated with cells) but there was no sign of caseation.

The Kidneys.—Showed sparsely scattered minute grey tubercles in the cortex.

Suprarenals.—A few minute whitish points were seen in the cortex of the right suprarenal; none in that of the left.

Thorax :

Heart.—The pericardial sac contained a small quantity of clear serous fluid; the heart muscle was dark and full of blood; the venticles and auricles contained dark-red blood clot; on the endoeardium of the right ventricle there were a few minute pearly-grey tubercles.

Pleura.—Along the margins of the ribs and on the tendon of the diaphragm there were some small congested vegetations, in some of which tiny grey foci were seen.

Lungs.—The small anterior lobes and the antero-ventral portion of the posterior lobes were dark red, firm, heavy, and quite airless; the posterior parts of the caudal lobes were diffusely congested, but were still air containing, the cut surfaces exuding slightly frothy blood-stained fluid. The lung tissue was elosely and evenly beset with minute grey tubercles, just visible to the naked eye. In the completely solid parts of the lung the small bronchi were filled with muco-pus.

Thoracic Glands.—The caudal mediastinal gland was about twice the normal in size and on section deeply congested; the cortex was packed with minute grey tubercles, which in several places had become confluent.

The glands anterior to this and the infra-tracheal glands were enlarged and similarly affected.

The bronchial glands were about twice the normal in size, and perhaps a little more severely affected than the mediastinal.

Tonsils.—No tubercles visible.

Pharynx, Larnyx and Trachea.—Appeared normal; the trachea contained frothy mucus.

Intestines.—The mucous membrane of the posterior two-thirds of the small intestine was intensely congested; no tubercles seen.

The Gastric, Mesenteric and Colic Glands.—Showed a small number of very minute grey foci.

Urinary Bladder, Eyes, Thyroid Body.—Normal.

The Gluteal, Ischiatic, Popliteal, Precrural, Iliac, Ileo-sacral, Lumbar, Renal, Vertebral, Ventral mediastinal, Right Prescapular, Right Prepectoral, Submaxillary, Parotid, and Pharyngeal Glands showed minute grey, or greyish white, foci in their cortices; in some of the glands (*e.g.* the submaxillary and pharyngeal) these foci were very numerous; many of the glands were deeply congested.

The Cœliac Glands.—Were enlarged; two of the larger ones resembled the portal; others had discrete grey foci in the cortex.

Several *Hæmolymph Glands* were seen to contain early tubercles.

Microscopical Examinations (Smear Preparations).

Iliac Gland.—Numerous tubercle bacilli.

Right Suprarenal.—Tubercle bacilli seanty.

Spherical Prepectoral Gland	Numerous tubercle bacilli.
Cœliac Gland - - -	
Spleen Pulp - - -	

VIRUS B XVIII.

January 30, 1905.

BRONCHIAL GLAND.

The specimens were the bronchial glands of a young cow. The left lung showed a few patches of tubercle; there was no trace of tuberculosis of pleura or of any other organs or glands. The two bronchial glands were beset with yellow caseous nodules, slightly gritty from calcification, which almost completely replaced the gland substance.

TABLE 18.

CULTURE INOCULATIONS.
VIRUS B XVIII.
(January 30, 1905.)
BRONCHIAL GLAND.

Animals inoculated on December 12, 1905, with culture derived from the original material.
The culture used was 20 days old, 16th generation, and had been in
cultivation for a period of 316 days.

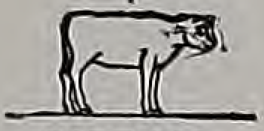
Culture kept throughout on pure serum.

CALF 360.
Subcutaneous.
Dose: 10 mg.
Killed March 13, 1906 (91 days after inoculation).

P.M.—Caseous gritty local lesion; adjacent glands enlarged, caseous, and gritty from calcification; sparsely scattered miliary calcareous tubercles in lungs, spleen, and liver; thoracic and portal glands contained numerous discrete calcareo-caseous tubercles; other lymphatic glands were normal or contained one or two calcareo-caseous tubercles.

RABBITS.
All Subcutaneous.

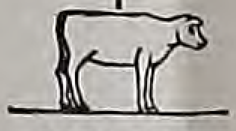
No.	Dose.	Duration of life.	Result.
591	1·0 mg.	D. 17 days	S.T. A few tubercles in lungs.
589	0·1 mg.	D. 67 days	G.T.
590	0·01 mg.	D. 173 days	G.T.
592	0·001 mg.	D. 97 days	G.T.



CALF 362.
Subcutaneous.
Dose: 10 mg.
Died February 3, 1906 (53 days after inoculation).

P.M.—Large caseo-necrotic local lesion; enlargement and caseation of nearest glands; numerous caseous nodules in all the organs and glands; lungs extensively consolidated.

Culture grown for 209 days on glycerin serum, and for 107 on pure serum.



CALF 364.
Subcutaneous.
Dose: 10 mg.
Died January 28, 1906 (47 days after inoculation).

P.M.—Large caseo necrotic local lesion; adjacent glands enlarged and extensively caseated; general tuberculosis; lungs and spleen packed with caseating nodules.

RABBITS.
All Subcutaneous.

No.	Dose.	Duration of life.	Result.
595	1·0 mg.	D. 88 days	G.T.
593	0·1 mg.	D. 90 days	G.T.
594	0·01 mg.	D. 86 days	G.T.
596	0·001 mg.	D. 15 days	Local lesion. One tubercle in lung.

CALF 366.
Subcutaneous.
Dose: 10 mg.
Died January 14, 1906 (33 days after inoculation).

P.M.—Caseo-necrotic local lesion; general tuberculosis (miliary).

RABBITS.

Inoculated on June 26, 1905, with culture derived from the original material.
The cultures used were the 8th generation, 21 days old and had been in cultivation a total period of 147 days.

Culture kept throughout on pure serum.

No. of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
343	1·0 mg.	Intraperitoneal	D. 12 days	G.T.
344	0·1 mg.	Intraperitoneal	D. 26 days	G.T.
342	0·01 mg.	Intraperitoneal	D. 25 days	G.T.
341	1·0 mg.	Subcutaneous	D. 62 days	G.T.
340	0·1 mg.	Subcutaneous	D. 57 days	G.T.

Culture grown for 64 days on glycerin serum.

No. of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
338	1·0 mg.	Intraperitoneal	D. 5 days	Enteritis.
339	0·1 mg.	Intraperitoneal	D. 6 days	
337	0.01 mg.	Intraperitoneal	D. 26 days	G.T.
336	1·0 mg.	Subcutaneous	K. 79 days (dying.)	G.T.
335	0·1 mg.	Subcutaneous	D. 66 days	G.T.

CALF 360.

Subcutaneous inoculation of culture derived from the original material of Virus B XVIII.

(The culture used was the 16th generation, 20 days old ; the virus had been in cultivation for a period of 316 days and during this period had been grown solely on serum.)

Dose—10 milligrammes.

Date—December 12th, 1905.

Weight—1 cwt. 0 qr. 17 lbs.

Killed—March 13th, 1906. 91 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on December 12th, 1905.

Ten days later there was a firm tumour, 4 in. by 3½ in. by about 1 in. in thickness, adherent to the skin and infiltrating the muscles ; the left prescapular gland measured 3½ in. in length ; the prepectoral glands were not perceptibly enlarged. . . .

On January 5th, 1906, 24 days after inoculation, the tumour measured 4¾ in. in length and 3 in. in breadth and was pear-shaped in outline ; the prescapular gland measured 4½ in. in length, and a prepectoral gland was felt to be slightly enlarged.

The tumour and the prescapular gland remained for some time stationary in size and then diminished slightly.

The general condition of the calf was moderately good throughout the whole of the experiment and there were no obvious signs of ill-health.

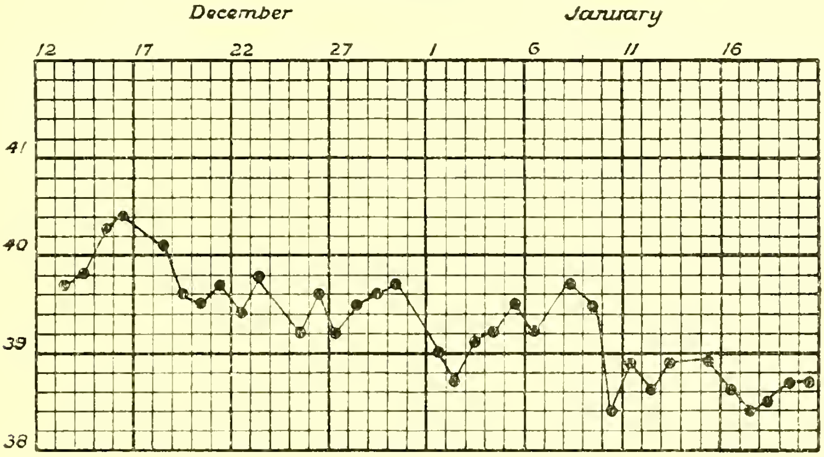
Weights.

There was a steady increase in weight during the experiment.

December 13th, 1905 -	- 1 cwt. 0 qrs. 17 lbs.
January 25th, 1906 -	- 1 cwt. 2 qrs. 5 lbs.
February 21st, 1906 -	- 1 cwt. 3 qrs. 0 lbs.
March 13th, 1906 -	- 1 cwt. 3 qrs. 16 lbs.

Gain in weight, 2 qrs. 27 lbs.
Rate of gain per week, 6·38 lbs.

Temperature.



During the remainder of the experiment the temperature was normal.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a firm tumour measuring 4 × 2½ × 1¼in.: on section it was composed of dense fibrous tissue containing irregular tough yellowish white caseous tracts ; the caseated tissue was appreciably gritty from calcification, chiefly around the margins, and showed in several places small cavities filled with caseo-pus. The skin over the tumour was thickened and intimately adherent, but not infiltrated ; the muscles under the upper part of the tumour were infiltrated ; but not under the lower.

The Left Prescapular Gland weighed 3 ozs. and measured 3 × 1¾ × 1¼in. ; on section the cortex of the gland, except for a small portion at one extremity which contained discrete pin-head-sized calcareous tubercles, was composed of dense yellowish caseated tissue, gritty chiefly around the margins ; no tubercles were seen in the medullary portion of the gland ; the capsule was greatly thickened, particularly on the convex surface, where at one place it measured 1 cm.

The Right Prescapular Gland was normal in size and contained one nodule, about 2 mm. in diameter, with a yellow caseous and slightly gritty centre and a fibrous margin.

Prepectoral Glands.—On the left side the spherical gland contained a minute spherical yellowish white tubercle ; the kidney-shaped gland contained a minute white point ; neither gland was enlarged.

On the right side the prepectoral glands were normal.

Cervical Glands.—On the left side a lower cervical gland contained a few discrete yellow tubercles, some gritty ; the upper cervical gland contained one yellow tubercle with a fibrous margin. Other cervical glands on the left side and all those on the right were normal.

A gland under the left scalenus muscle in front of the rib showed a few discrete yellow gritty tubercles.

Abdomen :

Omentum and Peritoneum.—Normal.

The Spleen weighed 12 ozs. ; on the surface were a few connective tissue processes ; the pulp contained sparsely scattered tubercles, ranging in size from 1 to about 2 mm. in diameter ; the tubercles had fibrous margins and yellow calcareous centres.

The Liver showed on the surface under the capsule sparsely scattered tubercles ranging in size from about 1 to a little over 2 mm. in diameter ; the tubercles had fibrous margins and yellow calcareous centres ; a few of the larger tubercles near the thin margin of the liver projected considerably above the surface. Sparsely scattered throughout the substance of the liver were spherical tubercles, the largest about 1 mm. in diameter, with yellow calcareous centres and fibrous margins.

The Portal Glands were not obviously enlarged ; they showed in the cortices fairly numerous discrete tubercles, the largest about 1 mm. in diameter, with yellow calcareous centres and fibrous margins.

Kidneys.—The right kidney showed in the cortex a cyst, filled with clear fluid, the size of a pigeon's egg ; scattered about over the surface minute grey points were seen, some of which on section extended into the cortex as radial streaks. The left kidney contained similar foci. In neither kidney were there any definite tubercles.

Suprarenal Bodies.—Normal.

Thorax :

Heart.—Normal.

Pleura.—Costal pleura normal; there was slight hypertrophy of the lymphatic fringes on the diaphragmatic pleura.

Lungs.—The lungs were normal in general appearance; they contained sparsely scattered tubercles ranging in size from a mere point to about 1 mm. in diameter; the larger ones had grey margins and yellow calcareous centres; many of the smaller ones were grey and translucent throughout. On the visceral pleura covering the diaphragmatic surface of the caudal lobes the lymphatic fringes following the lines of the interlobular septa were hypertrophied, and on the dorsal surface there were numerous small connective tissue tags; the pleura over several tubercles showed transparent filmy thickenings, in one case 7 cm. in diameter.

Larynx and Trachea.—Normal.

The Bronchial and Mediastinal Glands.—Were little if at all enlarged, and showed in the cortices discrete yellow calcareous tubercles varying in diameter up to 1 mm.

The Ventral Mediastinal Glands.—Were normal.

Tongue, Pharynx and Tonsils.—Normal.
Intestines.—Normal.
Mammary Gland.—Normal.
Thyroid Body.—Normal.
Eyes.—Normal.

Special Lymphatic Glands :

Coeliac Glands.—One contained fairly numerous discrete caseous miliary tubercles, some of which were just perceptibly gritty; another contained three caseous tubercles not appreciably gritty.

The Left Precrural Gland.—Contained three yellow gritty tubercles, with fibrous margins, the largest 1·5 mm. in diameter; the right was normal.

One Pudic Gland.—Contained two pin-head sized yellow gritty tubercles.

The Left Iliac Gland and the Left Gluteal.—Contained each one yellow gritty tubercle; the corresponding glands on the right side were normal.

The Left Submaxillary Gland.—Showed one minute white point, the right contained a small gritty tubercle.

The Popliteal, Ischiatic, Ilio-sacral, Lumbar, Renal. Axillary and Pharyngeal and Parotid Lymphatic Glands.—Were normal.

Mesenteric Glands.—One contained a small group of yellow pin-head sized tubercles; two others contained scattered tubercles; the rest were normal.

The Ileo-colic Glands.—Showed a few discrete yellow miliary tubercles, slightly gritty from calcification.

Gastric and Colic Glands.—Normal.

CALF 362.

Subcutaneous Inoculation of culture derived from the original material of Virus B. XVIII.

(Inoculated at the same time as Calf 360.)

Dose—10 milligrammes.

Date—December 12th, 1905.

Weight—1 cwt. 0 qr. 12 lbs.

Died—February 3rd, 1906. 53 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on December 12th, 1905.

On December 22nd, 1905, 10 days after inoculation, there was a firm flattened tumour measuring 5 in. by 3 in.; the left prescapular gland measured 3 in. in length and the rounded prepectoral gland was much enlarged.

On January 5th, 1906, 24 days after inoculation, there was a firm prominent tumour, flattened externally; the prescapular gland was very large and hard and measured 5 in. in length; the prepectoral gland was the size of a walnut.

On January 15th, 1906, the tumour measured 7 in. in length (from above downwards) and 4 in. in breadth; the prescapular and prepectoral glands were very hard and had diminished somewhat in size.

The calf remained in moderately good health until about the middle of January.

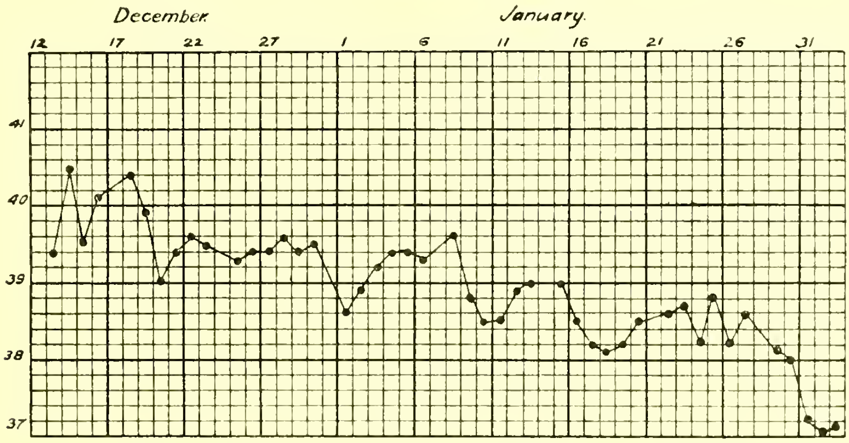
On January 15th, 1906, 34 days after inoculation, the calf was obviously ill; the respirations were increased and somewhat jerky and there was occasional cough. The respirations increased in frequency and became very laboured. The calf gradually lost appetite, flesh and strength, and died on February 3rd, 1906, 53 days after inoculation.

Weights.

December 13th, 1905 - -	1 cwt.	0 qr.	12 lbs.
January 25th, 1906 - - -	1 cwt.	0 qr.	6 lbs.

The calf lost 6 lbs. in weight during the experiment.

Temperature.



POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—At the seat of inoculation there was a firm tumour weighing 1lb. 1oz. (with skin and infiltrated muscles) and measuring 7 × 4 × 1¾ in.; on section it showed between the skin and muscles a mass of yellow caseo-necrotic tissue containing in the middle of the upper part a series of small spaces filled with serous fluid; at the level of the latter the caseated tissue penetrated deeply into the muscles; elsewhere the muscles adherent to the mass were fibroid and closely beset with yellow caseous nodules; the skin was firmly adherent, thickened and studded with yellow caseous tubercles; the superficial layer of the skin was fissured and necrosed.

The Left Prescapular Gland weighed 6 ozs and measured 3 × 2 × 2in.; on section it was composed throughout of dense pinkish yellow caseated tissue containing a few scattered calcareous particles.

The Right Prescapular (1¾ in. in length) showed in the cortex a moderate number of yellow caseous nodules, the largest 3 mm. in diameter; at one extremity there was a larger nodule composed of several smaller ones aggregated together.

Prepectoral Glands.—On the left side the spherical prepectoral gland measured ¾ in. in diameter, and on section resembled the left prescapular; the reniform gland, 1¼in. in length, showed the greater part of the cortex firm grey and closely beset with caseous tubercles; a small gland posterior to the latter lying in the first intercostal space contained three small caseous nodules and numerous small caseous foci

Cervical Glands.—On both sides the glands along the trachea were slightly enlarged and contained each one or two irregular caseating nodules; the superior cervical glands were normal.

Under the scalenus anticus on the left side there was an œdematous congested gland the size of a broad bean beset with irregular miliary caseous tubercles; the corresponding gland on the opposite side was enlarged and partly caseous.

Abdomen:

On the inferior surface of the omentum there were about nine congested lenticular nodules, the largest 5mm. in diameter; on section they were yellow in the centre; there were besides, several tubercles, the largest the size of a millet seed.

Parietal Peritoneum.—Normal.

The Spleen.—Was enlarged and weighed 11 ozs.; on section the pulp was dark red, soft, and crowded with firm yellow caseous nodules, somewhat irregular in outline, ranging from about 2 to 5 mm. in diameter.

The Liver.—Was enlarged and weighed 5 lbs; the substance was pale and contained moderately numerous greyish-yellow tubercles mostly 1 to 1·5 mm. in diameter; on the surface under the capsule there were some larger nodules, a few of which were slightly raised above the surface and mushroomed.

The Gall Bladder.—Was normal.

The Portal Glands.—Were enlarged and closely beset with caseating tubercles aggregated together into irregular nodules and masses.

Kidneys.—Each kidney showed on the surface about two dozen yellow caseous nodules, with grey margins, the largest about 2 mm. in diameter; similar nodules were seen in the depth of the cortex; some of the nodules were elongated in a radial direction.

The Left Suprarenal Body.—Contained one opaque miliary tubercle.

The Right Suprarenal Body.—Appeared normal.

Thorax:

Heart.—Normal.

Pleura.—The lymphatic fringes along the margins of the ribs were slightly hypertrophied and contained small tubercles, with here and there a flattened caseating nodule. On the mediastinal pleura there were several groups of caseous tubercles surrounded by congested connective tissue and a few scattered, loosely-attached lenticular nodules.

On the pleural surface of the diaphram, chiefly along the reflections of the mediastinal and caval olds of the pleura, there were small clusters of tubercles; there were also a few discrete nodules, one loosely-pedunculated and deeply hæmorrhagic.

The Lungs.—Did not collapse and were firm and very heavy; they weighed with the attached glands 9½ lbs., and were filled with firm caseating nodules, rregular in outline, ranging in size up to about 5 mm. in diameter; in the caudal lobes there were numerous large caseating masses; these were largest and most numerous in the left caudal lobe, where they affected whole lobules; in the right they were smaller, more irregular, and were evidently formed by the union of smaller nodules. The right cephalic lobe was reddish in colour and quite airless, and showed on section the bronchi much dilated and filled with yellow muco-pus; the right middle lobe was partly consolidated.

The Mediastinal and Bronchial Glands.—Were much enlarged, weighing together about 10 ozs; on section their cortices (except in two cases) were almost entirely composed of firm greyish tissue mottled with irregular yellow patches of caseation: two of the glands were closely beset with discrete caseating nodules; the medulla of each gland was congested.

Alimentary Tract.

Larynx and Trachea.—Normal.

The Tonsils.—Contained each two or three caseous nodules.

Tongue and Pharynx.—Normal.

Small Intestine.—The terminal Peyer's patch showed a few submucous yellow caseous nodules, up to 2 mm. in diameter; in the rest of the intestine there were a few sparsely scattered nodules.

Large Intestine.—Normal.

The Mesenteric Glands.—Not enlarged, contained numerous caseating nodules, irregular in outline, the largest about 1 cm. in diameter.

The Colic and Gastric Glands.—Contained discrete caseating nodules; one gastric gland, however, was indurated and closely beset with irregular caseous tubercles.

Eyes.—Normal.

Testicles.—Normal.

Bladder.—On the internal surface there was a projecting yellow caseous tubercle.

Special Lymphatic Glands:

Cœliac Glands.—A group of four, enlarged, indurated and closely beset with irregular caseous coalescing tubercles.

The Renal and Lumbar Glands.—Were enlarged and closely beset with caseating nodules.

The Precrural, Pudic, Popliteal, Gluteal, Submaxillary, Pharyngeal, Axillary and Right Iliac Glands, and the Left Parotid Gland.—Contained numerous caseating nodules, ranging in size up to 3 mm.

The Mastoid Glands and the Left Iliac Gland.—Contained each one caseating nodule.

The Right Parotid Gland and the Ischiatic Glands.—Were normal.

Several Hæmolymph Glands in various parts of the body contained caseous nodules.

CALF 364.

Subcutaneous inoculation of culture derived from the original material of Virus B XVIII.

(The culture used was the 16th generation, 20 days old. The total age of the culture was 316 days, during 209 of which it was grown on glycerin serum ; the last subculture was grown on pure serum.)

Dose—10 milligrammes.

Date—December 12th, 1905.

Weight—1 cwt. 0 qr. 17 lbs.

Died—January 28th, 1906. 47 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on December 12th, 1905.

Ten days later there was a firm prominent tumour, pear-shaped in outline, measuring 6 in. × 3 in. ; the prescapular gland measured 2½ inches in length and a prepectoral gland was the size of a walnut.

On January 5th, 1906, 24 days after inoculation, there was a moderately thick elongated tumour measuring 8 in. in length by 3½ in. in breadth and extending into the dewlap ; the lower extremity of the tumour was not so firm as the upper and was probably mainly œdematous. The prescapular gland now measured nearly 4½ in. in length. The tumour showed very little further increase in size, and the adjacent glands remained unaltered.

Constitutional symptoms were first observed on January 5th, 1906, 24 days after inoculation ; the respirations were a little increased in frequency ; the coat was rough and there was occasional cough.

The respirations slowly increased in frequency and the animal gradually began to lose appetite, flesh, and strength. During the last few days of life it was gravely ill, and the respirations were laboured and jerky.

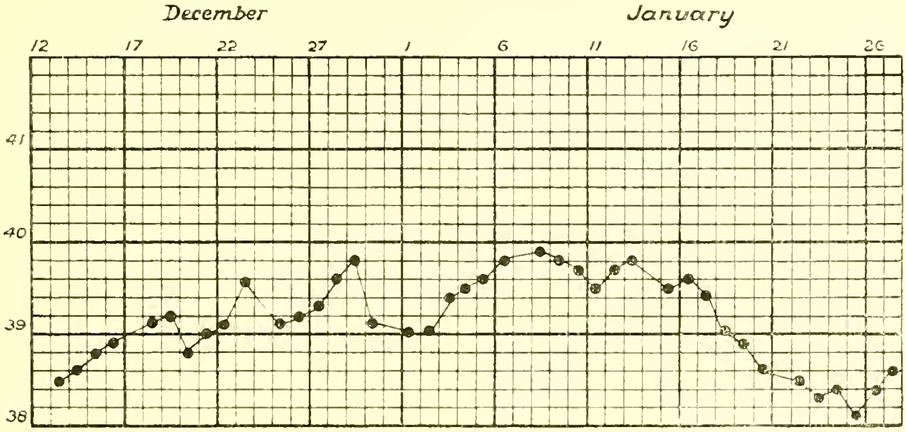
The calf died on January 28th, 1906, 47 days after inoculation.

Weights.

There was a steady decline in weight.

December 13th, 1905 -	1 cwt. 0 qr. 17 lbs.
January 25th, 1906 -	1 cwt. 0 qr. 7 lbs.
January 28th, 1906 -	1 cwt. 0 qr. 0 lbs.
Loss in weight - - - -	17 lbs.
Average loss per week - - -	2·53 lbs.

Temperature.



POSTMORTEM EXAMINATION.

Carcass in poor condition.

Local Lesion.—At the seat of inoculation there was an elongated firm tumour measuring 8 in. × 4 in. × about 1½ in. in greatest thickness and weighing with attached skin and muscles 1 lb. 10 ozs.

On section it was composed of dense yellow congested caseo-necrotic tissue adherent to and infiltrating both the skin and muscles.

In the middle of the upper part there was an irregular ragged cavity, crossed by soft trabeculæ, filled with slightly turbid reddish serous fluid.

The tissues around the inferior extremity of the tumour were congested and œdematous.

In the deep tissues between the local tumour and the prepectoral gland there was a series of caseating nodules (? in the course of a lymphatic vessel).

The Left Prescapular Gland.—Measured 3¼ in. × 2½ in. × 1½ in. and weighed 6 ozs. ; on section it was composed practically throughout of dense pinkish yellow caseated tissue ; the capsule was thickened, particularly on the convex surface.

The Right Prescapular Gland.—Was nearly twice the normal in size and contained numerous discrete yellow caseous nodules, slightly irregular in outline, the largest 4 mm. in diameter.

Left Prepectoral Glands :

On the left side the spherical gland measured 1 in. in diameter and was composed throughout of dense pinkish yellow caseo-necrotic tissue. The reniform gland was much enlarged (1½ in. in length) and showed part of the cortex firm, reddish, and penetrated with a yellow caseous network ; the rest of the gland was deeply congested and contained discrete caseous nodules.

The Right Prepectoral Glands.—Were enlarged and contained discrete caseous nodules.

Cervical Glands.—Along the left side of the trachea there was a series of four indurated glands, ranging in size from a sparrow's egg to that of a thrush ; on section they resembled the left prescapular gland.

The glands on the right side were enlarged and contained discrete caseous nodules.

Abdomen :

The Omentum.—Showed on the inferior surface about three dozen caseating nodules the largest the size of a wheat grain ; several were loosely pedunculated and all were deeply congested.

Parietal Peritoneum.—Normal.

There was one small tubercle on the suspensory ligament of the liver.

The Spleen.—Weighed 11 ozs. : on section the pulp was soft and closely beset with yellow caseous nodules, the largest 2 to 2·5 mm. in diameter.

The Liver.—Was pale and showed on the surface under the capsule a moderate number of greyish white nodules ranging in size from a mere point up to about 3 mm. in diameter ; the larger ones were flattened and slightly raised above the surface ;

on section they had translucent margins and yellow centres. In the depth of the lung there were scattered caseating tubercles, the largest not more than 1·5 mm. in diameter.

Gall Bladder.—On the mucous surface there were about ten projecting caseous nodules, the largest 2 mm. in diameter.

The Portal Glands.—Were enlarged and showed in the cortices nodular masses composed of grey translucent tissue and a yellow caseous network.

The Kidneys.—Were very pale; each showed in the cortex scattered tubercles with opaque centres, the largest a little over 1 mm. in diameter.

The Left Suprarenal.—Showed in the cortex one pin-head sized greyish white tubercle.

The Right Suprarenal.—Contained two tubercles, the largest 1 mm. in diameter.

Thorax :

Heart.—The pericardial sac contained a small quantity of yellow serous fluid; heart muscle and valves normal.

Pleura.—The pleural cavities contained a few cubic centimetres of yellow serous fluid: on the pleural surface of the diaphragm there was one caseous nodule the size of a wheat grain; on the costal pleura there were two or three smaller nodules; the lymphatic fringes were not hypertrophied.

The Lungs.—Were heavy and weighed with the mediastinal and bronchial glands, 6 lbs. 12 ozs.

The cephalic lobes, the right middle lobe, and the antero-ventral portions of the caudal lobes were firm, red, and quite airless; the caudal lobes became more and more crepitant toward the posterior part, but were everywhere much firmer than normal.

The substance of the lungs was crowded with greyish yellow nodules varying in size from about 1 to 3 mm. in diameter; the nodules were irregular in outline and in many places had coalesced.

The Pulmonary Arteries were filled with agony clot.

The Trachea and Bronchi were filled with froth.

The Mucous Membrane of the Larynx was intensely congested.

The Mucous Membrane of the Trachea.—Showed a few scattered yellow foci, congested around the margins.

The Dorsal Mediastinal and Bronchial Glands.—Were much enlarged and showed the cortices composed of firm translucent grey tissue penetrated with a yellow caseous network; the medullæ of the glands were congested.

The Ventral Mediastinal Glands.—The vertebral glands and all the numerous small glands along the thoracic aorta were enlarged and closely beset with caseating nodules which in some had become confluent.

The Thymus.—Contained a number of caseous nodules similar to those in the peripheral lymphatic glands.

Alimentary Tract:

The Tongue.—Was normal.

The Pharynx.—Was congested; no tubercles seen.

Tonsils.—Each contained numerous caseous nodules, beginning to soften.

Small Intestine.—The long terminal Peyer's patch contained numerous softened caseous nodules, the largest about 3 mm. in diameter; they were raised above the surface and showed a small central opening in the mucous membrane covering them, through which the softened caseous material could be squeezed; in the rest of the intestine they were more sparsely distributed, except in the duodenum, where they were again found in rather large numbers.

Large Intestine.—The solitary follicles in the large intestine were enlarged; those in the cœcum and first part of the colon contained a small quantity of purulent material in their interior.

The Mesenteric Glands.—Were enlarged; thsoe at the extremities of the mesentery resembled the dorsal mediastinal glands, but were not so advanced in caseation; the glands in the middle of the mesentery contained more or less discrete caseous nodules.

The Ileo-colic, Colic and Gastric Glands.—Resembled the terminal mesenteric glands.

Eyes.—Normal.

Testicles.—Normal

Urinary Bladder.—Normal.

Thyroid.—Normal.

Special Lymphatic Glands :

The Cœliac Glands were enlarged; the largest was firm and composed throughout of grey translucent tissue mottled with yellow caseous patches; the other glands contained more or less discrete caseating nodules. The *renal* and *lumbar glands* were closely beset with coalescing caseating nodules.

The Iliac, Ilio-Sacral, Pudic, Precrural, Popliteal, Gluteal, Ischiatic, Axillary, Mastoid and Parotid Glands.—Were enlarged and contained numerous discrete yellow caseous nodules, slightly irregular in outline, the largest 4 mm. in diameter.

The Submaxillary and Retro-pharyngeal glands.—Were enlarged and more closely beset with caseous nodules.

All the Hœmolymph Glands in various parts of the body were enlarged and contained caseous nodules similar to those in the peripheral lymphatic glands.

Microscopical Examination.

Bronchial Gland	Numerous tubercle bacilli.
Popliteal Gland	
Right suprarenal body	
Follicle in large intestine	

CALF 366.

Subcutaneous inoculation—Of culture derived from the original material of Virus B. XVIII.

(Inoculated at the same time and with the same culture as Calf 364.)

Dose—10 milligrammes.

Date—December 12th, 1905.

Weight—2 qrs. 25 lbs.

Died—January 14th, 1906. 33 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on December 12th, 1905.

Ten days later there was a firm tumour, measuring 3½ in. by 2½ in.; the prescapular gland measured 2½ in. in length. The tumour increased in size and on January 5th, 1906, attained its maximum, 5½ in. by 4½ in.; it was firm, flattened on the surface and of a moderate thickness; there was some oedema of the dewlap and the muscles between the tumour and the gland were felt to be thickened; the prescapular gland measured 4½ in.; the prepectoral gland was not apparently enlarged. The calf was first noticed to be ill on January 5th, 1906, twenty-four days after inoculation; it was quiet, lying down during most of the day, the respirations were slightly quickened and there was occasional cough.

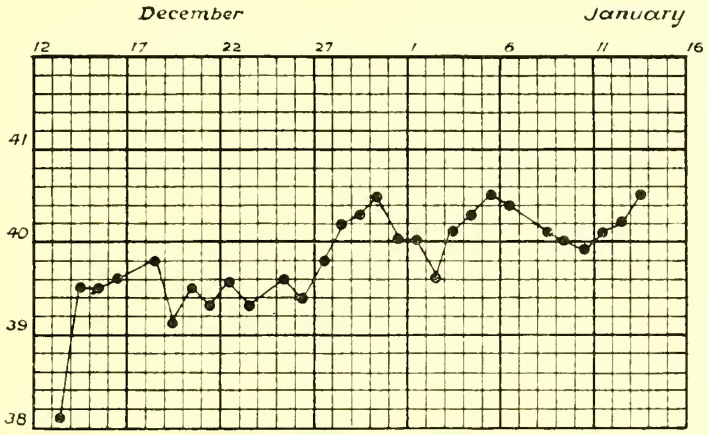
Acute illness rapidly supervened; the breathing became quicker and more and more embarrassed; during the last few days there was marked dyspnœa.

Weights.

December 13th, 1905	- -	2 qrs. 25 lbs.
January 14th, 1906	- -	2 qrs. 22 lbs.

There was a loss in weight of 3 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a firm tumour measuring 5¼ in. by 3 in. by 1½ in., and weighing with skin and attached muscles, 11 ozs.

On section it was composed of dense pinkish-yellow necrotic tissue, spongy and juicy in the centre; the skin and adjacent muscles were congested, adherent and infiltrated; the tissues around the lower extremity of the tumour were œdematous.

The Left Prescapular Gland.—Measured 3½ in. by 1¾ in. by 1½ in., and weighed 5 ozs.; on section the greater part of the cortex was composed of dense yellow caseated tissue. A small portion of cortex at one extremity was grey and in a state of early caseation; the medulla was fibroid.

Right Prescapular Gland.—Normal in size, contained moderately numerous yellow caseating tubercles, with congested margins, the largest about 2 mm.

Prepectoral Glands.—On the left side the kidney shaped gland was much enlarged, firm and deeply congested: no tubercles seen on section; rounded prepectoral not found. On the right side the glands contained discrete caseating tubercles.

Cervical Glands.—On the left side a large gland near the entrance to the thorax showed three-quarters of its substance dense yellow and caseous; a mid-cervical gland under the lower extremity of the tumour the size of a thrush's egg was dense and caseous throughout; a gland anterior to the latter was enlarged and showed the cortex firm, grey and translucent with no caseous foci; another small gland and the superior cervical contained discrete caseous tubercles.

The glands on the right side showed each a few early tubercles.

Abdomen :

On the inferior surface of the omentum there were numerous flattened nodules, some in clusters, the largest 4 mm. in diameter; they were opaque in the centre, and many were loosely pedunculated and congested around the margins.

There were one or two similar nodules on the peritoneum covering the diaphragm near the spleen: otherwise the parietal peritoneum was normal.

Spleen.—Enlarged, weighed 8 ozs.; on section the pulp was soft and contained numerous yellow necrotic nodules with congested margins, the largest about 3 mm. in diameter.

Liver.—Showed on the surface under the capsule numerous greyish white tubercles ranging from a mere speck up to 1·5 mm. in diameter; on section the substance of the liver was pale and soft and contained numerous evenly-distributed greyish opaque tubercles, the largest about 1 mm. in diameter.

The Gall Bladder.—Showed under the mucous membrane a yellow pin-head sized tubercle.

The Portal Glands.—Were enlarged and œdematous; the cortices were firm and greyish, containing aggregated tubercles which had not begun to caseate.

The Kidneys.—Showed on the surface and on section, numerous grey tubercles, slightly opaque in the centre, the largest 1 mm. in diameter.

The Right Suprarenal Body.—Showed in the cortex one minute pearly white tubercle.

The Left Suprarenal Body.—Was normal.

Thorax :

Heart.—Muscle and valves normal.

Pleura.—The fringes along the margins of the ribs were congested and in places hypertrophied;

they showed a few scattered tubercles, with congested margins, the largest 2 mm. in diameter. There were also a few small tubercles on the diaphragm and on the pleura covering the pericardium.

Lungs.—The left cephalic lobe showed several recent adhesions to the chest wall and the pericardial pleura. The lungs were heavy, the cephalic lobes, the right middle lobe and the greater portions of the caudal lobes being firm, dark red and quite airless; the posterior and dorsal portions of the caudal lobes were still air containing, but mottled with dark red patches of consolidation. On section the lung tissue was engorged with blood and contained numerous evenly distributed grey tubercles with opaque centres ranging from about 0·5 to 1 mm. in diameter. There were a few flattened caseating tubercles on the surface of the right middle lobe.

The Bronchial and Dorsal Mediastinal Glands.—Were enlarged and deeply congested; on section the cortices of the mediastinal glands were firm and beset with coalescing tubercles, many just beginning to necrose; the substance of the bronchial glands was soft and contained more or less discrete grey tubercles.

Bronchi.—The bronchi in the solid lobes contained muco pus.

Larynx.—There was a small congested tubercle on each arytenoid cartilage.

Trachea.—The mucous membrane showed small scattered ulcerated tubercles, with congested margins

Alimentary Tract:

Tongue, Pharynx and Tonsils.—Normal.

Small Intestine.—The long Peyer's patch contained a few pin-head sized yellow tubercles; none seen elsewhere; the mucous membrane of the ileum was congested.

Large Intestine.—Mucous membrane of cæcum congested: no tubercles.

The Mesenteric and Ileo-Colic Glands.—Contained sparsely scattered greyish white miliary tubercles.

Various Lymphatic Glands:

One Cœliac Gland.—Was enlarged; the cortex was firm and grey and showed beginning caseation.

The Precrural, Pudic, Popliteal, Gluteal, Axillary, Parotid and Mastoid Glands.—Contained each a few yellow tubercles, with congested margins, the largest 2 mm. in diameter.

The Submaxillary and Retro-Pharyngeal Glands.—Contained similar but more numerous tubercles.

The Iliac and Lumbar Glands.—Showed each a few greyish white tubercles.

Several Haemolymph Glands along the anterior border of the right scapula showed small caseating tubercles.

Eyes and Testicles.—Normal.

Microscopical Examination (smear preparation).

Tubercle from Gall Bladder.—Moderately numerous tubercle bacilli.

VIRUS B XIX.

March 27, 1905.

BRONCHIAL GLAND.

The specimens were the bronchial glands from a cow, aged four years, which had slight tuberculosis of one lung.

The glands, little if at all enlarged, contained firm creamy white caseous nodules each about the size of a pea. They were very slightly gritty and were arranged chiefly in groups.

CULTURE INOCULATIONS.

VIRUS B XIX.

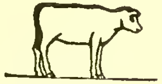
(March 27, 1905).

BRONCHIAL GLAND.

Inoculated on June 8, 1905, with culture derived from the original material.

The culture used was the 5th generation; 21 days old.

The total age of the culture was 71 days.



CALF 288.

Subcutaneous.

Dose: 50 mgs.

Killed, June 22, 1905 (14 days).

P.M.—Early general tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
315	0·1 mg.	Intravenous	D. 25 days	G.T.
318	1·0 mg.	Intraperitoneal	D. 17 „	G.T.
316	0·1 mg.	Intraperitoneal	D. 61 „	G.T.
319	1·0 mg.	Subcutaneous	D. 5 „	—
317	0·1 mg.	Subcutaneous	D. 59 „	G.T.

CALF 288.

Subcutaneous inoculation of culture derived from the original material of Virus B XIX.

Date.—June 8th, 1905.

Dose.—50 milligrammes

Weight.—2 qrs. 7 lbs.

Killed.—June 22nd, 1905. 14 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 8th, 1905.

A day or two before it was killed the calf became obviously ill, and the rate of respiration was much increased.

This animal was one of a series of three, which were inoculated with 50 mg. of a bovine culture and killed at intervals of 3, and 14 days for the purpose of comparing histologically the lesions produced with those produced after similar intervals of time in calves by the inoculation of 50 mg. of a slightly virulent virus.

The temperature began to rise on the sixth day; on the seventh it had reached 40·3°C., and remained high until the end of the experiment, varying between 40·1 and 40·9°C.

POST-MORTEM EXAMINATION.

Local Lesion.—On the left side of the neck there was a slightly elevated firm swelling measuring 4 in. in length and 3½ in. in breadth.

On removal and section there was seen, between the skin and muscles, a layer, a little over ½ in. in greatest thickness, composed of firm somewhat translucent tissue showing yellow streaks of necrosis; in the middle of the upper two-thirds of this tissue there was a layer of breaking down caseo-necrotic tissue containing a series of irregular spaces filled with turbid fluid. The muscles and skin were adherent but not apparently infiltrated.

The Left Prescapular Gland.—Weighed nearly 2 ozs. and measured 3 in. in length by 1 in. in breadth; the cortex was firm, and showed about two-thirds yellow and necrotic, the rest grey with here and there early foci of necrosis; the areas most advanced in necrosis were congested.

The Left Spherical Prepectoral Gland.—Measured 1·5 cm. in diameter and showed about half the substance composed of pinkish yellow necrotic tissue and half of firm translucent tissue, penetrated with a fine greyish yellow network.

Other Prepectoral Glands were normal.

Abdomen :

On the inferior surface of the omentum were scattered grey tubercles, the largest the size of a mustard seed.

Spleen.—Weighed 4¼ ozs.; on section the Malphigian bodies appeared swollen; they showed, however, no sign of central necrosis.

The Liver.—Showed under the capsule numerous minute grey specks; similar points could be seen, though with difficulty, throughout the liver substance.

Portal Glands.—The cortices appeared firmer and greyer than normal, but there were no foci of necrosis.

Kidneys.—The cortex of each kidney contained very numerous small pale grey tubercles seen on the surface as well as on section.

Suprarenal Bodies.—Normal.

Thorax :

Heart.—There were numerous pin-point grey tubercles on the endocardium of the right ventricle.

Pleura.—Normal.

Lungs.—The lungs were deeply congested, particularly the right caudal and the dorsal part of the left caudal lobes; in the small anterior lobes there were several dark red collapsed lobules; there were also one or two collapsed lobules in the caudal lobes; the congested areas were brick red in colour and on section exuded, when squeezed, blood-stained slightly frothy œdema fluid; pieces floated in water. The substance of the lungs was closely peppered with minute dark tubercles; these in the paler lobules were seen as reddish, sometimes as greyish red spots, whilst in the congested parts they appeared as dark grey foci; scattered about were also a few slightly larger grey tubercles, the largest about the size of a pin's head.

The Bronchial and Mediastinal Glands.—Were slightly enlarged: the medullæ were deeply congested; the cortical zones were firm and grey, but there were no foci of necrosis visible.

Several Hæmolymph Glands, near the prescapular glands, contained small grey tubercles (one microscopically showed numerous tubercle bacilli).

The Peripheral and other Lymphatic Glands not mentioned above were normal to the naked eye.

VIRUS B XX.

March 27, 1905.

MEDIASTINAL GLAND.

The bronchial and mediastinal glands were taken from a young healthy looking bull, three to four years old. There was no sign of tubercle elsewhere. The glands contained discrete pea-sized yellow caseo-calcareous nodules and one or two larger softened caseous masses slightly gritty from calcification.

CULTURE INOCULATIONS.

VIRUS B XX.

(March 27, 1905).

MEDIASTINAL GLANDS.

RABBITS.

Inoculated on July 20, 1905, with culture derived from the original material.

The culture used was the 7th generation ; 20 days old.

The total age was 115 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of of Life.	Result.
378 - - - -	0·1 mg.	Intravenous	D. 19 days	G.T.
375 - - - -	1·0 mg.	Intraperitoneal	D. 15 „	G.T.
376 - - - -	1·0 mg.	Intraperitoneal	D. 14 „	G.T.
377 - - -	0·1 mg.	Intraperitoneal	D. 21 „	G.T.
372 - - - -	0·01 mg.	Intraperitoneal	D. 2 „	Coccidiosis of Liver.
374 - - - -	1·0 mg.	Subcutaneous	D. 73 „	G.T.
373 - - - -	0·1 mg.	Subcutaneous	D. 2 „	Coccidiosis of Liver.

No Calves were inoculated with this virus.

VIRUS B XXI.

April 18, 1905.

BRONCHIAL GLAND.

The specimens, bronchial glands, were taken from a young cow which showed no sign of tuberculosis elsewhere. The gland on section showed firm yellow caseous nodules, not perceptibly gritty.

CULTURE INOCULATIONS.

VIRUS B. XXI.

(April 18, 1905.)

BRONCHIAL GLANDS.

RABBITS.

Inoculated on July 18, 1905, with culture derived from the original material.
The culture used was the 6th generation ; 18 days old.
The total age of culture was 91 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
354 - - - -	0·1 mg.	Intravenous	D. 18 days	G.T.
353 - - - -	1·0 mg.	Intraperitoneal	D. 27 „	G.T.
355 - - - -	0·1 mg.	Intraperitoneal	D. 21 „	G.T.
357 - - - -	0·01 mg.	Intraperitoneal	D. 12 „	Coccidiosis of Liver.
352 - - - -	1·5 mg.	Subcutaneous	D. 79 „	G.T.
364 - - - -	1·0 mg.	Subcutaneous	D. 70 „	G.T.
356 - - - -	0·1 mg.	Subcutaneous	D. 18 „	Coccidiosis of Liver

No Calves were inoculated with this virus.

VIRUS B XXII.

April 18, 1905.

LYMPHATIC GLANDS.

A pectoral and one sub-dorsal (?) gland were taken from a young heifer which showed slight tuberculosis also of the lungs. In both the glands, which were not apparently enlarged, there were yellowish necrotic streaks and foci; one or two calcareous particles were seen but no definite caseation.

VIRUS B. XXII.

(April 18, 1905.)

Inoculated on September 4, 1905, with culture derived from the original material, through Guinea-Pig 1509.

The culture used was the 6th generation ; 20 days old.

The total age of culture was 109 days.

DOG 70.

Subcutaneous.

Dose : 1·0 mg.

Killed, well, February 6, 1906.
(155 days.)

P.M.—No tuberculosis.
(*See* page 400.)

DOG 72.

Intraperitoneal.

Dose : 1·0 mg.

Killed, well, February 7, 1906.
(156 days.)

P.M.—There were a few nodules in the lung, and some yellow points in the liver ; there was no disease of the peritoneum. (*See* page 401.)

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
419	0·1 mg.	Intravenous	Died 22 days	G.T.
417	1·0 „	Intraperitoneal (partly Intra-cœcal)	„ 101 „	G.T.
422	1·0 „	Intraperitoneal	„ 21 „	G.T.
420	0·1 „	Intraperitoneal	„ 28 „	G.T.
423	0·01 „	Intraperitoneal	„ 27 „	G.T.
418	1·0 „	Subcutaneous	„ 79 „	G.T.
421	0·1 „	Subcutaneous	„ 113 „	G.T.

No Calves were inoculated with this virus.

VIRUS B XXIII.

May 11 1905.

LUNG.

The specimens, a piece of lung and the mediastinal glands, were removed from a young cow which showed no sign of disease elsewhere. The piece of lung contained a solid mass $2+2+1\frac{1}{2}$ *inches composed of softened caseous nodules bound together by fibrous tissue. The mediastinal glands contained numerous yellow gritty nodules, mostly about the size of peas, but some that of kidney beans; the latter were softened.*

VIRUS B XXIII.

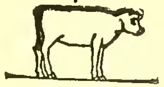
(May 11th, 1905.)

LUNG.

CULTURE INOCULATIONS.

Inoculated on August 29th, 1905, with Culture derived from the original material.

The Culture used was the 6th generation, 20 days old and had been in cultivation a total period of 110 days.



CALF 344.
Subcutaneous.
Dose : 10 mg.
Died, October 16th, 1905.
(48 days.)
P.M.—General Tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
384	0·1 mg	Intravenous	19 days	G.T.
382	1·0 mg	Intraperitoneal	12 days	G.T. Tubercles very minute.
386	0·1 mg	Intraperitoneal	28 days	G.T.
387	0·01 mg	Intraperitoneal	42 days	G.T.
383	1·0 mg	Subcutaneous	49 days	G.T.
385	0·1 mg	Subcutaneous	79 days	G.T.

CALF 346.
Subcutaneous.
Dose : 10 mg.
Died, October 6th, 1905.
(38 days.)
P.M.—General Tuberculosis.

CALF 344.

Subcutaneous Inoculation of culture derived from the original material of Virus B. XXIII.

Dose—10 milligrammes.

Date—August 29th, 1905.

Weight—2 qrs. [Age—6 weeks.]

Died—October 16th, 1905. 48 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on August 29th, 1905.

Eight days later there was a firm tumour measuring 2 in. by 1½ in. by about ½ in. in greatest thickness; the left prescapular gland measured 2 in. in length.

On September 13th, 1904, 15 days after inoculation, the tumour measured 3½ in. by 3 in. by ¾ in.; the prescapular gland measured 3½ in. in long diameter; the prepectoral glands were not perceptibly enlarged. Subsequently both the tumour and the prescapular gland became a little larger.

The calf was first noticed to be ill on September 30th, 1904, 32 days after inoculation; the respirations were slightly increased and there was frequent cough. The condition of the animal gradually became worse; the respirations increased in frequency, and latterly there was appreciable loss in flesh.

The calf was found dead on October 16th, 1905, 48 days after inoculation.

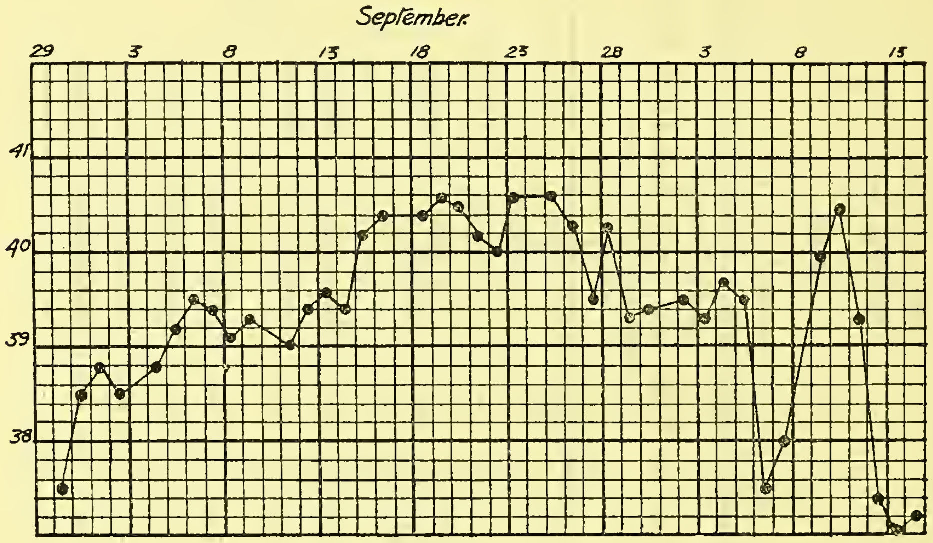
Weights.

During the first fortnight there was a gain in weight of 3 lbs.; then for a month the weight was stationary. in the last six days there was a loss of 9 lbs.

	qrs.	lbs.
August 29th, 1905 - - - - -	2	0
September 12th, 1905 - - - -	2	3
October 10th, 1905 - - - - -	2	2
October 16th, 1905 - - - - -	1	21

Loss in weight.—7 lbs.

[*Temperature.*



POST-MORTEM EXAMINATION.

Condition.—Poor.

Local Lesion.—The local tumour consisted of a lenticular mass of yellow caseo-necrotic tissue, 3½ in. by 3 in. by ⅔ in., adherent to the skin and muscles, both of which were infiltrated with yellow caseous nodules. The skin over the middle part of the tumour was soft and entirely necrotic. The tumour, with the skin and muscle, measured 1¼ ins. in greatest thickness.

Extending from the local tumour towards the prescapular gland there was a thickened nodular caseous lymphatic vessel.

Left Prescapular Gland.—Weighed 3 ozs., and measured 3 in. by 1½ in. by 1½ in. On section almost the whole of the gland was composed of dense yellow caseo-necrotic tissue; there was a small patch in the centre of the gland of fibrous tissue, containing discrete tubercles. The capsule was slightly thickened.

Left Prepectoral Glands.—The rounded prepectoral, the size of a pea, was firm, greyish red, and speckled with opaque caseous foci. The kidney-shaped gland showed part of the cortex firm and caseating, and in the rest irregular caseating nodules, similar to those in the peripheral glands. A third gland resembled the one first described.

Right Prescapular Gland, Right Prepectoral Glands.—Contained discrete caseating nodules, the largest about 4 millimetres in diameter.

Cervical Glands.—On the left side one of the lower cervical glands was caseous throughout; one more anterior resembled the rounded prepectoral, and another was packed with coalescing caseating nodules. Other glands on the left side, and all those on the right, contained discrete caseous nodules, as in the peripheral glands.

Abdomen :

Omentum.—Was studded with firm caseating nodules, congested around the margins, the largest about the size of a wheat grain. They were somewhat flattened, irregular in outline, and in several places confluent. There were similar nodules scattered over the surfaces of the stomach, small intestines, mesentery, mesocolon, meso-testis, parietal peritoneum, and bladder.

Spleen.—Weighed 10 ozs., and showed on the surface numerous raised flattened nodules, irregular in outline, the largest 1 centimetre in diameter; they consisted of fibroid tissue, containing yellow patches of necrosis.

On section the pulp was filled with irregular nodules, ranging up to 5 millimetres in diameter, packed closely together. The nodules were greyish white, semi-opaque, and had yellowish centres, not perceptibly gritty.

Liver.—Showed on the surface fairly numerous caseating nodules, the largest about 5 millimetres in greatest diameter. On the convex surface they were flattened and barely raised above the surface; on the concave they formed well marked projections. On section nodules were evenly distributed throughout the substance; they were opaque, yellowish white, slightly irregular in outline, and ranged in diameter up to about 3 millimetres. Some of the nodules showed signs of beginning calcification, but were not perceptibly gritty.

Gall Bladder.—Normal.

Portal Glands.—Were considerably enlarged, and showed the whole of the cortices composed of confluent nodular caseating masses.

Kidneys.—The left kidney showed on the surface about a dozen nodules with grey margins and yellow centres; these on section were elongated in a radial direction, the largest being a little smaller than a wheat grain.

On the surface of the right kidney there were similar nodules, but fewer in number, and generally larger. Similar nodules were sparsely scattered in the depth of the cortex.

Suprarenal Bodies.—Normal.

Thorax :

Heart.—There was a caseous tubercle under the endocardium of the right ventricle. Heart otherwise normal.

Lungs.—Practically the whole of the right cephalic and right middle lobes were dark red, firm, and quite airless; the ventral flap of the left cephalic and the antero-ventral portion of the left caudal were in a similar condition. The lung tissue contained fairly numerous firm caseating nodules, ranging up to 2·5 or 3 millimetres in diameter; the nodules were whitish, semi-opaque, and showed opaque yellowish white foci in the centre, probably of beginning calcification.

In various parts of the lung, in the crepitant as well as in the solid, were firm masses, lobular in outline, consisting of greyish red translucent tissue, speckled with caseous foci.

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged (3½ ins. in length). The cortex was composed throughout of dense translucent fibroid tissue, mottled with irregular caseous patches, showing here and there opaque yellowish foci of beginning calcification.

Other dorsal mediastinal glands, the bronchial, peribronchial and œsophageal, were similarly affected.

An infra-tracheal gland showed the greater part of its substance replaced by caseating nodules.

Near the apex of the heart there was a large gland, which resembled on section the mediastinal.

Pleura.—The parietal pleura showed along the anterior margins of the ribs a few scattered flattened nodules, most numerous in the dorsal regions.

On the pleura covering the pericardium there were one or two nodules and several pinhead-sized caseous tubercles.

Diaphragm.—On the pleural surface of the diaphragm there were several congested nodules, similar to those on the omentum.

On the peritoneal surface of the diaphragm there were numerous raised flattened nodules, the largest 1·5 by 1 centimetre. They were most numerous on the right side, where many of the smaller nodules had coalesced; they consisted of dense greyish tissue, mottled with yellowish patches.

Palate.—On the upper surface of the soft palate there was a caseous tubercle, the mucous membrane over which had ulcerated.

Tonsils.—Each tonsil contained one or two caseous nodules.

Trachea.—The mucous membrane of the treachea showed a few small ulcers, with soft caseous floor and slightly raised congested margins.

Stomach.—There were fairly numerous caseating nodules in the submucous tissue.

Small Intestine.—The long Peyer's patch showed numerous raised nodules, with a small central ulcer, through which soft caseous material could be squeezed. Other Peyer's patches contained similar nodules in smaller numbers; there were also scattered submucous nodules, over which the mucous membrane was not ulcerated.

Large Intestine.—Normal.

Urinary Bladder.—There was one pinhead-sized congested caseous nodule under the mucous membrane.

Testicles.—Normal.

Various Lymphatic Glands :—

Cœliac, Lumbar, Renal.—Were enlarged, indurated, and advanced in caseation.

Ilio-Sacral, Iliac, Pudic, Popliteal, Gluteal, Parotid, Submaxillary, Pharyngeal, Axillary, Ventral Mediastinal, Vertebral.—Were enlarged, and contained numerous firm caseating nodules, irregular in outline, the largest 4 and 5 millimetres in diameter, which in many of the glands had coalesced. The nodules showed in the centre signs of beginning calcification, but were not perceptibly gritty.

Mesenteric Glands.—Were enlarged, indurated, and in the majority of cases showed the whole of the cortex composed of coalescing caseating nodules.

Gastric Glands, Colic Glands.—Were enlarged, and resembled the mesenteric.

Most of the haemo-lymph glands contained nodules similar to those in the peripheral lymphatic glands.

CALF 346.

Subcutaneous Inoculation of culture derived from the original material of Virus B XXIII.

Dose—10 milligrammes.

Date—August 29th, 1905.

Weight—2 qrs. 20 lbs. [Age—6 weeks.]

Died—October 6th, 1905. 38 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on August 29th, 1905.

Eight days later there was a firm tumour measuring 2½ in. by 2½ in. by a little over ½ in. in greatest thickness; the prescapular gland measured 2 in. in length.

On September 13th, 1905, 15 days after inoculation, the tumour measured 4 in. by 3½ in. by 1 in. and infiltrated both skin and muscles. It continued to grow and became more prominent.

On September 22nd, 1905, slight œdema around the inferior part of the tumour was noticed; the left prescapular gland measured 4 in. in length.

On September 30th, 1905, the œdema was more marked and had extended into the dewlap; the respirations were slightly increased in frequency.

From this date the calf rapidly became acutely ill, and died on October 6th, 1905, 38 days after inoculation.

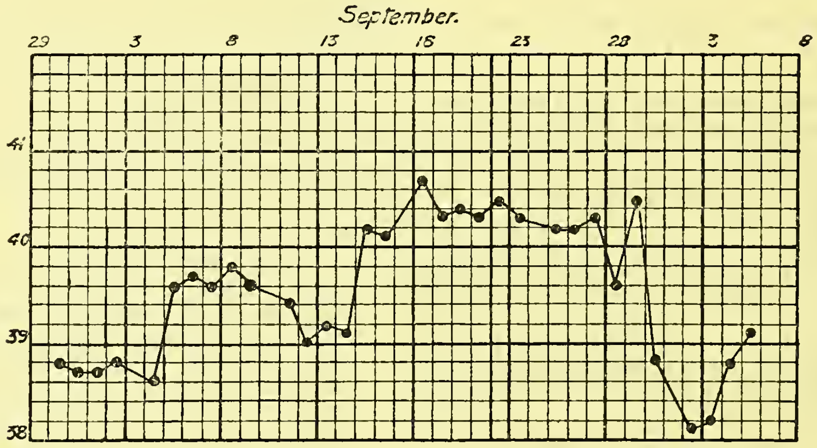
Weights.

During the first three weeks there was a gain in weight of 8 lbs.; then there was a steady decline in weight, the calf losing 13 lbs. in the last 17 days.

	qrs.	lbs.
August 29th, 1905 - - - - -	2	20
September 19th, 1905 - - - -	3	0
October 6th, 1905 - - - - -	2	15

Loss in weight.—5 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Poor.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a mass of dense fibrous tissue 4½ in. by 4 in. by 2 in., with a fine yellowish caseous network. The centre was beginning to soften, but there was no cavity. Weight 15 ozs.

Left Prescapular Gland.—Measured 3¼ in. by 2 in. by ¼ in., and weighed 5 ozs. The cortex was composed of firm yellowish caseated tissue, becoming less dense around the medulla.

Left Prepectoral Glands.—Were œdematous. One contained three irregular caseous tubercles; the spherical gland was firm and caseous throughout.

Right Prepectoral Glands.—Contained a few small yellow tubercles.

Cervical Glands.—Three upper cervical glands on the left side contained one to four small caseous tubercles. The mid cervical gland on this side was caseous throughout, and the lower contained numerous caseating tubercles.

The glands on the right side showed small caseating tubercles.

Abdomen :

Omentum.—On the surface of the omentum were a moderate number of loosely attached tubercles; the majority had opaque centres, and a few were deeply congested.

Spleen.—Was enlarged, weighed 11 ozs., and was closely packed with grey tubercles, yellow and opaque in the centre, giving the cut surface a coarsely granular appearance.

Liver.—Contained fairly numerous discrete grey tubercles, the largest opaque in the centre, ranging in size from a point up to 1·5 millimetre in diameter.

Gall Bladder.—In the mucous membrane of the gall bladder were six opaque caseous tubercles.

Portal Glands.—Contained fairly closely aggregated yellowish tubercles up to a pinhead in size.

Kidneys.—Contained sparsely scattered grey tubercles, some opaque and yellowish in the centre, ranging in size from a point up to a little over a millimetre in diameter.

Suprarenals.—The left suprarenal contained one small opaque tubercle.

Renal Glands.—Contained numerous irregular caseous tubercles around the cortices.

Thorax :

Heart.—On the endocardium of the right ventricle was an opaque tubercle the size of a small shot.

Parietal Pleura.—Normal.

Lungs.—The lungs contained numerous closely set discrete grey tubercles with yellowish caseous centres. They were rather irregular, but the majority were the size of a No. 4 shot. The right cephalic and middle lobes were solid, except for a little emphysema along the margins; the anterior part of the caudal lobe was solidified, and in the rest of the substance were small collapsed areas. The left cephalic and anterior portion of the left caudal lobe were solid.

Bronchial and Mediastinal Glands. — Were enlarged, and their cortices were almost entirely replaced by yellow caseated tissue ; in the medullary portions there were discrete tubercles.

The ventral mediastinal glands contained scattered irregular yellow tubercles,

Tonsils, Pharynx, Larynx.—Normal.

Trachea.—There were several flattened grey tubercles in the trachea.

Small Intestine.—Scattered over the mucous membrane was a moderate number of minute tubercles. They were more numerous in the Peyer's patches.

Large Intestine.—There were a few similar tubercles in the large intestine.

Mesenteric Glands.—The mesenteric glands contained yellowish tubercles in the cortices, closely aggregated in two glands.

Ileo-Colic Glands.—Contained yellowish foci.

Gastric Glands.—Contained irregular yellow tubercles

Other Lymphatic Glands :

Popliteal, Pudic, Gluteal, Axillary.—Contained small caseous tubercles.

Iliac, Ilio-Sacral, Ischiatic.—Contained a few similar tubercles.

Submaxillary, Post-Pharyngeal.—Contained numerous caseous tubercles.

Parotid.—Contained a few caseous tubercles.

Cœliac.—Contained numerous yellowish foci, and one was caseous throughout.

Testicles.—Normal.

Microscopical Examination.

Heart }
Trachea } A few tubercle bacilli.

Suprarenal.—Six tubercle bacilli seen.

Parotid Gland.—A few tubercle bacilli.

VIRUS B XXIV.

May 18, 1905.

LUNG.

Lung and bronchial and mediastinal glands from young cow. On the surface of the lung there was a prominent "grapy" growth; the tissue of the lung contained scattered fibroid nodules, the largest the size of a pea, showing slight central necrosis. The glands were but slightly affected; three contained each a large pea-sized fibroid nodule with a yellow network of necrosis in the centre; the two larger glands showed a few yellow discrete foci.

VIRUS B. XXIV.

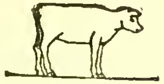
(May 18th, 1905.)

LUNG.

Culture Inoculations.

Inoculated on August 29th, 1905, with culture derived from the original material.

The sub-culture used was the 6th generation, 20 days old ; the total age of the culture was 103 days.



CALF 340.

Subcutaneous.

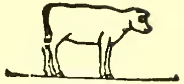
Dose : 10 mg.

Killed, November 29th, 1905 (92 days)

P.M.—General tuberculosis.

RABBITS.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
392	0·1 mg.	Intravenous	D. 18 days	G.T.
388	1·0 mg.	Intraperitoneal	D. 18 days	G.T.
390	0·1 mg.	Intraperitoneal	D. 31 days	G.T.
393	0·01 mg.	Intraperitoneal	D. 33 days	G.T.
389	1·0 mg.	Subcutaneous	D. 81 days	G.T.
391	0·1 mg.	Subcutaneous	D. 48 days	G.T.



CALF 342.

Subcutaneous.

Dose : 10 mg.

Killed, November 28th 1905 (91 days).

P.M.—General tuberculosis.

CALF 340.

Subcutaneous Inoculation of culture derived from the original material of Virus B XXIV.

Dose—10 milligrammes.

Date—August 29th, 1905.

Weight—2 qrs. 21 lbs. [Age—6 weeks.]

Killed—November 29th, 1905. 92 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck.

Eight days later there was a firm well-defined tumour, measuring 3 in. by 2½ in. by about ¾ in. in greatest thickness; the prescapular gland was enlarged and measured 2½ in. in length.

On September 13th, 1905, 15 days after inoculation, the tumour attained its maximum, 5 in. by 4 in. by nearly 1½ in. in thickness; it was adherent to the skin and infiltrated the muscles; the prescapular gland measured 4 in. in length; the muscles between the tumour and the gland were slightly thickened.

On September 22nd, 1905, a small hard gland was felt between the skin and the inferior extremity of the prescapular gland; one of the prepectoral glands was also felt to be enlarged.

On November 1st, 1905, the tumour had become a little more prominent and gave a distinct sense of fluctuation towards the end of the experiment; prominent swellings were observed in the region of the parotid glands.

On October 10th, 1905, 6 weeks after inoculation, the respirations were noticed to be slightly increased in frequency, and during the remainder of the experiment they were a little quicker than normal, but were never laboured or jerky; on exertion, however, the calf became very breathless.

With this exception the general condition of the animal was moderately good; it increased in weight but did not grow quite at the same rate as the fellow calf (No. 342).

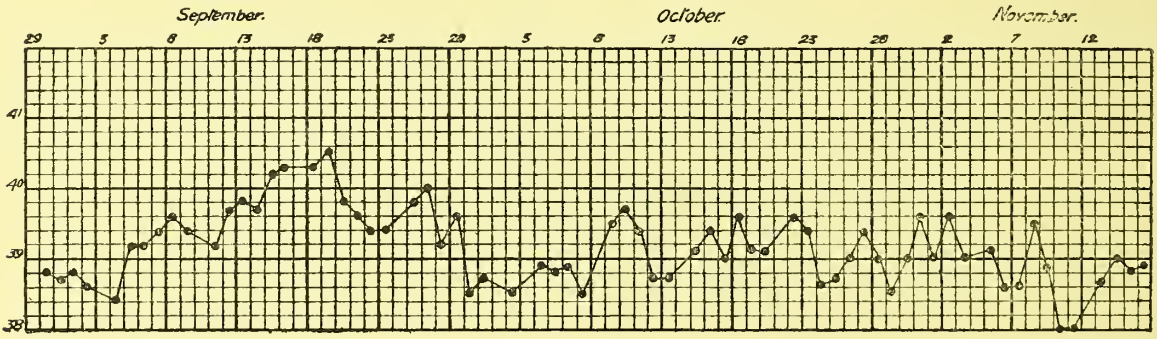
Weights.

The animal steadily increased in weight.

	cwt.	qrs.	lbs.
August 29th, 1905 - - -	0	2	21
November 29th, 1905 - - -	1	0	14

Gain in weight.—1 qr. 21 lbs.
Average weekly increase.—3·73 lbs.

Temperature.



POST-MORTEM EXAMINATION.

General Condition.—Moderate.

Local Lesion.—At the seat of inoculation there was a fluctuating tumour, which measured 4½ in. by 4 in. by 2½ in., and weighed with the skin and muscles attached to it 12 ozs. On section it contained a cavity surrounded by a thick wall of fibrous tissue. The cavity was filled with caseo-purulent material and thin turbid serous fluid. Attached to the inner wall of the cavity was a large mass of dense caseo-necrotic tissue, slightly gritty around the periphery. In the muscles under the tumour were numerous yellow gritty tubercles, and running towards the prescapular gland a nodular caseous lymphatic vessel.

Left Prescapular Gland.—Weighed 2½ ozs., and measured 3 in. by 1¾ in. by 1¼ in. On section it was composed practically throughout of pinkish yellow caseo-necrotic tissue, slightly gritty from calcification; the capsule was much thickened, particularly on the convex side.

In the subcutaneous tissues near the inferior extremity of the prescapular gland there was a small gland, which showed part of the cortex dense, caseous and gritty, and part beset with caseous gritty tubercles.

Right Prescapular Gland.—Contained numerous soft yellow caseous nodules with thin fibrous capsules, the largest 1 centimetre in diameter.

Left Prepectoral Glands.—On the left side the spherical gland was the size of a pea, and showed a small part of the cortex caseous and gritty. The reniform gland contained about half a dozen caseous nodules, up to 5 millimetres, some of which were softened. On the right side one gland contained a caseous nodule, another was almost completely caseous and softened.

Axillary Glands.—Were much enlarged, and contained yellow caseous nodules, varying in size. The nodules were very slightly gritty, and some were quite soft; all had fibrous capsules.

Cervical Glands.—On the left side the upper cervical (near the mastoid process) showed at one extremity a patch of dense gritty caseous tissue, and numerous discrete yellow caseous softening nodules up to 5 millimetres in diameter. All the other left cervical glands and the right cervical glands were enlarged and contained similar nodules, varying in size; in the right upper cervical the nodules were very large, soft, and had fibrous capsules.

Thorax:

Pleura.—Costal pleura normal. There was slight hypertrophy of the lymphatic fringes on the diaphragmatic pleura, chiefly on the right side, where there were two or three small hard tubercles.

Lungs.—The right lung contained a moderate number of yellow gritty tubercles, the majority about 1 millimetre or slightly more in diameter. There were numerous dark red irregular patches of consolidation, mostly small, but some occupying the whole of a lobule. In the midst of the caudal lobe there was a solid lobule containing soft caseous nodules. The antero-ventral portion of the left caudal lobe was consolidated, and showed the lobules composed of dense grey translucent tissue, penetrated with a yellow network, or showing yellow gritty foci; the surface of this portion had an uneven nodular appearance. In the left anterior lobe, chiefly around the margins, there were similar solid tuberculous lobules; in other parts of the left lung there were caseous tubercles and red consolidated patches, as in the right lung.

Trachea, Larynx.—Normal.

Thoracic Glands.—The caudal mediastinal gland was enlarged, three and a half inches in length, and showed in the cortex firm caseous gritty areas, irregular in outline, and discrete nodules and tubercles; the medulla was congested. The glands anterior to the latter in the dorsal mediastinum and the bronchial and peribronchial glands showed similar caseous areas, more completely occupying the cortex.

The ventral mediastinal glands were much enlarged, and contained yellow caseous nodules, varying in size. The nodules were very slightly gritty and some quite soft; all had fibrous capsules.

Heart.—Normal.

Abdomen :

Peritoneum.—There was a tubercle with a yellow gritty centre and fibrous margin on the peritoneum covering the diaphragm.

Omentum.—On the under surface of the omentum there were six similar tubercles.

Spleen.—Was enlarged (weight 12 ozs.), and on section showed the pulp filled with soft yellow spherical caseous nodules with thin fibrous walls, ranging from 2 to 4 millimetres in diameter; in the centres of the nodules minute calcareous grains were seen.

Liver.—In the middle of the anterior surface were numerous congested connective tissue tags, slenderly attached to the capsule, and small pearly grey points; at the base of several of the former a small tubercle was seen in the substance. Under the capsule there were sparsely scattered tubercles, ranging from about 0·5 to 2 millimetres in diameter; the latter projecting slightly from the surface. They had fibrous margins and caseous gritty centres. On section yellow gritty tubercles, the largest a little more than 1 millimetre in diameter, were sparsely distributed throughout the substance.

Gall Bladder.—Normal.

Portal Glands.—Were enlarged, and closely beset with caseous gritty nodules, with thin fibrous capsules, ranging from 1 to 2 millimetres in diameter.

Kidneys.—The left kidney showed on the surface a few grey miliary tubercles, homogeneous throughout; one had an extremely minute opaque central point. On section a few tubercles were seen in the depth; two of these were distinctly yellow in the centre.

In the right kidney there were about a dozen tubercles on the surface and a few in the depth; some of these were grey, whilst the others were opaque and yellow in the centre.

Suprarenal Bodies.—Normal.

Alimentary Tract :

Tongue, Pharynx.—Normal.

Tonsils.—The left tonsil contained a small caseous nodule.

In the right several follicles were filled with secretion. No tubercles seen.

Small Intestine.—The long Peyer's patch showed numerous rounded elevations, the largest 1·5 millimetre in diameter, mostly with a central umbilication. On section in the submucous tissue there was in each case a small collection of caseo-pus surrounded by a fibrous capsule. In the rest of the intestine there were fairly numerous similar, but generally smaller, nodules, each showing a small central opening with congested margins; these nodules appeared more numerous in the mucous membrane than in Peyer's patches.

Large Intestine.—The solitary follicles were a little enlarged and congested, but there was no sign of caseation.

Gastric Glands, Mesenteric Glands, Colic Glands.—Were all much enlarged. They were firm, and beset with soft yellow caseous, slightly gritty, nodules with fibrous capsules, ranging in size up to about 3 millimetres. Of the mesenteric glands, the terminal glands were most severely affected, the nodules replacing almost the whole of the gland tissue.

Special Glands :

Right Renal Gland, Lumbar Glands, Coeliac Glands.—Were enlarged, and closely beset with miliary caseous gritty tubercles.

Iliac Glands, Ilio-Sacral Glands.—Were much enlarged, and cotained yellow caseous nodules, varying in size. The nodules were very slightly gritty, and some quite soft: all had fibrous capsules.

Precrural.—Were much enlarged, and beset in the cortex with yellow caseous nodules, the largest of which was nearly 1 centimetre in diameter. The nodules were very slightly gritty, and some were quite soft; all had fibrous capsules.

Pudic, Gluteal, Popliteal, Vertebral.—Were much enlarged, and contained similar nodules to those in the precrural glands, varying in size.

Parotid.—Were greatly enlarged, and projected prominently during life. On section the cortex was almost completely replaced by large soft yellow caseous nodules, with thin fibrous capsules, the largest 1 centimetre in greatest diameter.

Pharyngeal.—Were also much enlarged, each to the size of a hen's egg, and closely beset with similar rather smaller nodules.

Submaxillary.—Were much enlarged, and closely beset with nodules similar to but rather smaller than those in the parotid glands.

Microscopical Examination.

Secretion from Right Tonsil.—No tubercle bacilli, but numerous other organisms.

CALF 342.

Subcutaneous Inoculation of culture derived from the original material of Virus B XXIV.

Dose—10 milligrammes.

Date—August 29th, 1905.

Weight—2 qrs. 10 lbs. [Age—6 weeks.]

Killed—November 28th, 1905. 91 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on August 29th, 1906.

Eight days later there was a slightly raised firm tumour 2 in. in diameter; the left prescapular gland measured about 2 in. in length.

The tumour increased slowly in size and became more prominent; on September 22nd, 1906, 24 days after inoculation, it measured 4½ by 3¼; the prescapular gland measured 3½ in. in length and a prepectoral gland was about the size of a Barcelona nut.

During the rest of the experiment the local condition remained unchanged.

The general condition was moderately good throughout the experiment and no signs of ill-health were noticed.

Weights.

The calf was weighed every week and showed a steady increase in weight.

	cwt.	qrs.	lbs.
August 29th, 1906 - - -	0	2	10
November 28th, 1906 - -	1	0	17

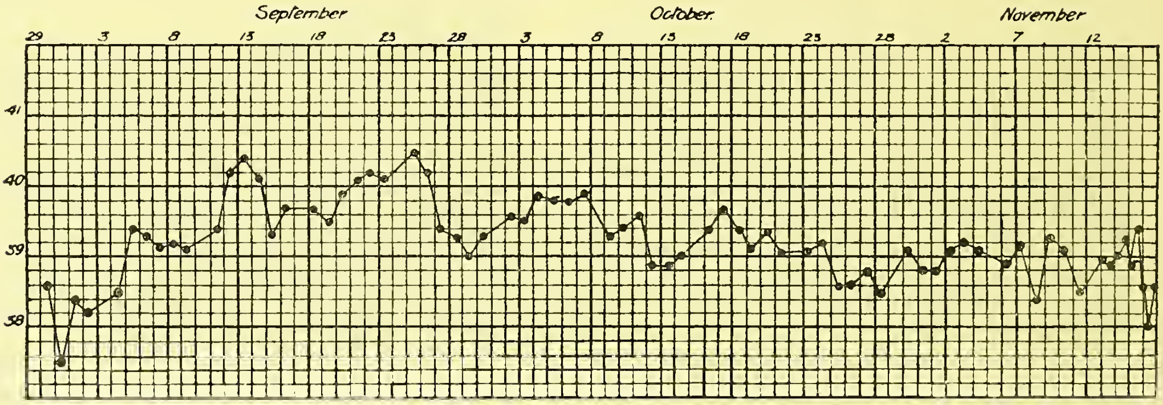
Gain in weight.—2 qrs. 7 lbs.

Rate of gain per week.—4·85 lbs.

Tuberculin Test.

November 17th, 1905, 80 days after inoculation. Positive. Rise of temperature, 1·7 C.

Temperature.



POST-MORTEM EXAMINATION.

General Condition.—Fair.

Local Lesion.—On the left side of the neck there was a firm tumour, which measured 4¾ in. in length by 3 in. in breadth. On removal and section between the skin and muscles there was a mass of tough yellowish white caseated tissue, nearly an inch in greatest thickness. The mass was surrounded by a zone of translucent fibrous tissue, and was adherent to the skin and muscles. The latter were infiltrated to a slight extent, chiefly under the central part of the mass; the skin was greatly thickened, and showed a few translucent tubercles with yellow centres.

Left Prescapular Gland.—Weighed 2⅜ ozs., and measured 3 in. by 1¾ in. by 1¼ in. On section the greater part of the cortex was composed of dense yellowish white caseated tissue, slightly gritty around the margins; near the hilum a small part of the cortex was beset with irregular discrete yellow gritty tubercles.

A small gland at the inferior extremity of the prescapular gland contained two millet seed sized gritty tubercles, and several minute yellow points.

Right Prescapular Gland.—Contained four small yellow gritty tubercles.

Prepectoral Glands.—On the left side the spherical gland, the size of a marble, showed part of the cortex composed of dense yellowish white slightly gritty caseated tissue and in the rest discrete yellow gritty tubercles, each about the size of pins' heads. The kidney-shaped gland contained two yellow gritty tubercles.

On the right side one prepectoral gland contained two gritty tubercles; another was normal.

Axillary Glands.—Contained discrete yellow tubercles, irregular in outline, the largest about 1·5 millimetre in diameter; some of the tubercles were softened.

One hæmo-lymph gland in the right axilla showed a pinhead-sized yellow gritty tubercle.

Cervical Glands.—On the left side a mid-cervical gland, the size of a sparrow's egg, was dense and caseous throughout, and slightly gritty; another showed three-quarters of its substance in a similar condition; three others contained each two or three calcareous tubercles. On the right side all the glands contained each a few discrete tubercles.

Thorax:

Pleura.—There was slight hypertrophy of the lymphatic fringes on the diaphragmatic pleura and on the costal pleura near the vertebral column. On the diaphragm there were two or three small hard fibrous tubercles, one of which was loosely attached and deeply congested.

Lungs.—Were crepitant, and there were no large areas of consolidation. They contained fairly numerous evenly distributed tubercles, varying very little in size, mostly about 1·5 millimetre in diameter; the tubercles had grey margins, and yellow highly calcareous centres; many were surrounded by small reddish areas, irregular in outline.

Larynx, Trachea.—Normal.

Thoracic Glands.—The mediastinal and bronchial glands were enlarged. The long caudal gland measured five inches in length, and showed in the cortex irregular patches of caseo-calcareous substance, formed by aggregated tubercles, and numerous discrete yellow gritty tubercles. The glands anterior to the latter and the bronchial glands were similarly affected, the caseo-calcareous patches being somewhat larger.

The ventral mediastinal glands contained irregular yellow gritty tubercles, the size of pins' heads.

Heart.—Normal.

Abdomen :

On the floor of the abdomen there were numerous pearly grey tubercles, and some rather larger loosely attached fibrous tubercles, the largest a little over 1·5 millimetre in diameter.

Omentum.—Showed three loosely attached flattened nodules, up to 2 millimetres, with yellow slightly gritty centres.

Small Intestine, Large Intestine.—Appeared normal.

Gastric Glands.—Contained discrete tubercles.

Mesenteric Glands, Colic Glands, Ileo-Colic Glands.—Were enlarged, and showed in the cortices yellow gritty tubercles, or irregular caseo-calcareous patches, formed by aggregated tubercles.

Spleen.—Weighed 8 ozs., and contained moderately numerous hard spherical yellow tubercles, the largest about 1.5 millimetre in diameter ; they were gritty in the centre and had delicate fibrous margins.

Liver.—Showed evenly distributed throughout the substance not very numerous opaque yellow tubercles, the largest about 1 millimetre in diameter ; some were very slightly gritty. On the surface under the capsule the tubercles appeared more numerous than in the depth ; they ranged in size from 0·5 to 3 millimetres in diameter, and on the anterior surface some were considerably flattened out, and but slightly raised from the surface. On the posterior surface many tubercles formed hemispherical projections ; the surface tubercles had yellow centres and grey margins.

Gall Bladder.—Showed one small tubercle with a yellow centre.

Portal Glands.—Were enlarged, and showed their cortices beset with yellow gritty caseous tubercles irregular in outline, and in places aggregated together.

Kidneys.—The left kidney showed on the surface about a dozen tubercles, ranging in size from a millet seed to a wheat grain. They were composed of translucent fibrous tissue, slightly opaque in the centre ; similar tubercles were seen in the depth of the cortex ; none in the medulla.

The right kidney contained similar, but rather more numerous tubercles.

Suprarenals.—Each suprarenal body showed in the cortex a fibrous tubercle with a yellow centre, in one case slightly gritty.

Renal Glands, Lumbar Glands.—Contained numerous small tubercles.

Coeliac Glands.—One, the size of a bean, was caseo-calcareous practically throughout ; others contained more or less discrete yellow gritty tubercles.

Iliac Glands, Ilio-Sacral Glands.—Contained discrete yellow gritty tubercles, irregular in outline, the largest about 1·5 millimetre in diameter ; some of the tubercles were softened.

Genito-Urinary System :

Testicles, Mammary Gland.—Normal.

Special Glands :

Precrural, Pudic, Gluteal, Ischiatic, Popliteal.—Contained discrete yellow gritty tubercles, irregular in outline, the largest about 1·5 millimetre in diameter : some of the tubercles were softened.

Submaxillary, Parotid, Retropharyngeal.—Contained fairly numerous tubercles, similar to those in the precrural glands ; some were arranged in little groups.

Mastoid.—The left mastoid gland showed an irregular calcareous mass, and several small discrete yellow gritty tubercles.

Tongue, Tonsils, Pharynx.—Normal.

Eyes.—Normal.

VIRUS B XXV.

June 26, 1905.

GROWTH FROM PLEURA.

The specimens, portions of the lung and pleura, were taken from a young cow which showed no signs of disease elsewhere.

Both the pleura and the lung showed on the surface firm pinkish translucent "mushroomed" growths containing yellow foci of necrosis; the tissue of the lung appeared normal.

CULTURE INOCULATIONS.

VIRUS B XXV.

(June 26, 1905).

PLEURA.

RABBITS.

Inoculated on September 5, 1905, with culture derived from the original material.

The culture used was the 4th generation ; 20 days old.

The total age of culture was 71 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
433 - - - -	0·1 mg.	Intravenous	D. 22 days	G.T.
430 - - - -	1·0 mg.	Intraperitoneal	D. 24 „	G.T.
432 - - - -	0·1 mg.	Intraperitoneal	D. 23 „	G.T.
435 - - - -	0·01 mg.	Intraperitoneal	D. 45 „	G.T.
431 - - - -	1·0 mg.	Subcutaneous	D. 86 „	G.T.
434 - - - -	0·1 mg.	Subcutaneous	D. 79 „	G.T.

No Calves were inoculated with this Virus.

VIRUS B XXVI.

August 1, 1905.

BRONCHIAL GLAND.

The specimen sent was the bronchial gland of a bull, two years old; the lungs were affected in places; there was no disease elsewhere.

The gland measured $3\frac{1}{4}+2\frac{1}{2}+1\frac{1}{4}$ *inches, and, with the exception of a few islands of fibrous tissue, was composed throughout of yellow caseo-calcareous material breaking down in the centre of the gland.*

VIRUS B XXVI.

(August 1st, 1906.)

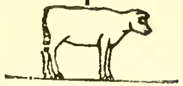
BRONCHIAL GLAND.

CALVES.

Inoculated with culture derived from the original material.

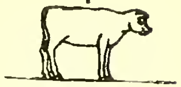
June 5th, 1906.

The culture used was the 13th generation, 14 days old : the total age of the culture was 308 days.



CALF 418.

Subcutaneous.
Dose : 50 mg.
Died, August 28th, 1906.
76 days.
P.M.—General tuberculosis.



CALF 422.

Subcutaneous.
Dose : 50 mg.
Died, July 19th, 1906.
44 days.
P.M.—General tuberculosis.

RHESUS MONKEYS.

Inoculated June 6th, 1906.

The culture used was the 13th generation, 14 days old ; the total age of the culture was 308 days.

MONKEY 142.

Subcutaneous.
Dose : 0·001 mg.
Died, July 21, 1906.
45 days.
P.M.—General tuberculosis.

MONKEY 144.

Subcutaneous.
Dose : 0·1 mg.
Killed dying, August 1st, 1906.
56 days.
P.M.—General tuberculosis.

MONKEY 146.

Subcutaneous.
Dose : 1·0 mg.
Died, July 21st, 1906.
45 days.
P.M.—General tuberculosis.

MONKEY 148.

Subcutaneous.
Dose : 10 mg.
Died, July 11th, 1906.
35 days.
P.M.—General tuberculosis.

RABBITS.

Inoculated November 20th, 1905.

The culture used was the 6th generation, 20 days old ; the total age of the culture was 111 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
517	0·1 mg.	Intrav.	D. 19 days	G.T.
515	1·0 mg.	Intrap.	D. 22 „	G.T.
513	0·1 mg.	Intrap.	D. 69 „	G.T.
516	0·01 mg.	Intrap.	D. 30 „	G.T.
518	0·1 mg.	Subcut.	D. 81 „	G.T.
514	0·01 mg.	Subcut.	D. 121 „	G.T.

Inoculated June 5th, 1906, at the same time as Calves 418 and 422.

899	1·0 mg.	Intrav.	D. 12 days	G.T.
901	0·001 mg	Intrav.	D. 2 „	—
900	1·0 mg.	Intrap.	D. 18 „	G.T.

CALF 418.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI.

Dose—50 milligrammes.

Date—June 5th, 1906.

Weight—2 qrs. 8 lbs.

Died—August 20th, 1906. 76 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 5th, 1906.

On the next day there was a slight thickening 1¼ in. in diameter. On the fourth day the thickening measured 2 by 1½ in. and the prescapular gland was slightly enlarged.

On June 16th, 11 days after inoculation, there was a firm flat tumour 3½ in. by 2½ in., the skin over the central part of which had broken down, exposing yellow caseo-necrotic material; the left prescapular gland measured a little over 3 in. in length.

On June 26th, 3 weeks after inoculation, the tumour measured 4½ in. by 3 in. in area and about 1 in. in thickness; in the upper part there was a deep ulcer about half-an-inch in diameter; the prescapular gland measured 3¼ in. in length and a prepectoral gland was the size of a pea. The general condition of the animal remained good.

On July 6th, 1906, 31 days after inoculation, the respirations were noticed to be slightly increased in frequency and the calf appeared to be losing flesh and was backward in its growth.

The tumour increased a little further in size and the ulcer gradually enlarged, a cavity being formed in the centre of the tumour.

The general condition of the animal remained much about the same for a long time, the respirations being only slightly more frequent than normal.

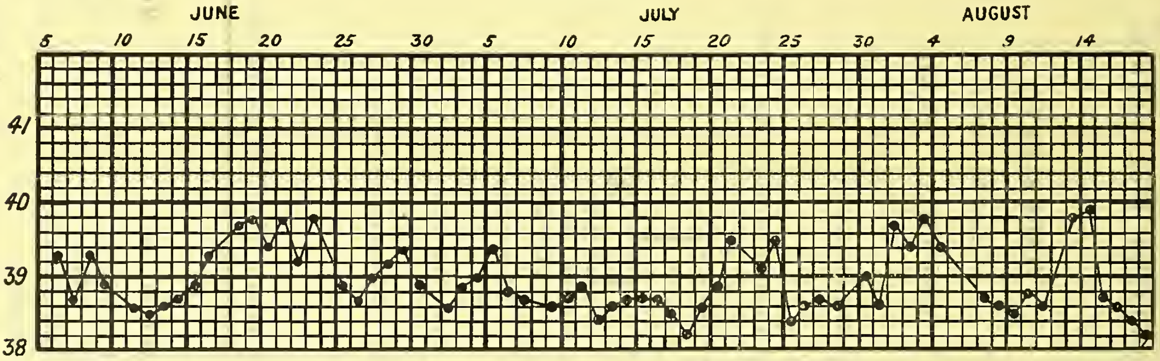
During the last week of life the respiration increased a little in frequency and became distinctly laboured. The calf was found dead on August 20th, 1906.

Weights.

	cwt.	qrs.	lbs.
June 5th, 1906 - - - -	0	2	8
June 25th, 1906 - - - -	0	2	11
August 20th, 1906 - - -	0	2	4

Loss in weight on the initial weight.—4 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Moderate.

Local Lesion.—On the left side of the neck there was a somewhat flattened tumour measuring 5½ in. in length, 3 in. in breadth and about 1 in. in greatest thickness. It showed on the external surface a deep ulcer, 3 in. by 1 in., which communicated with a flat space in the centre of the tumour; on section this space was found to be surrounded by a comparatively thin layer of dense yellow caseo-necrotic tissue which was adherent to the skin and slightly infiltrated the muscles; the internal wall, where exposed to the air through the ulcer, was covered with a brownish black layer of dried discharge; elsewhere the space was lined with soft rather foul-smelling caseo-pus.

The Left Prescapular Gland weighed a little over 2 ozs., and measured 3 in. by 1½ in. by 1½ in. and on section was composed throughout of dense homogeneous yellow caseated tissue showing no sign of calcification; the capsule of the gland was slightly thickened.

The Right Prescapular Gland was normal.

Prepectoral Glands.—On the left side the rounded prepectoral, the size of a marble, was yellow and caseous around the margins, firm and translucent in the centre; the reniform gland, the size of a large bean, showed a large caseous patch at one extremity, elsewhere a pea-sized caseous nodule and several discrete caseous tubercles. On the right side the glands were normal.

Cervical Glands.—A lower cervical gland on the left side, the size of a thrush's egg, resembled on section the left prescapular; the left upper cervical gland contained two hemp seed-sized caseous tubercles; other cervical glands on the left side were normal. On the right side two in the middle of the neck were enlarged to the size of kidney beans; one was three-quarters caseous; the other contained a pea-sized caseous nodule.

A gland just within the entrance to the thorax on the left side, the size of a pigeon's egg, was dense yellow and caseous practically throughout.

Thorax :

Lungs.—The lungs collapsed only partially and were congested and mottled with dark red angular patches of consolidation, largest and most numerous in the anterior lobes.

The lung parenchyma contained numerous evenly distributed nodules ranging in size from 2 mm. up to 1 cm. in diameter; these on section were yellow and caseous in the centre, grey around the margins, the larger ones having a lobular outline; between the nodules there were a few scattered tubercles with caseous centres up to 1 mm. in diameter.

The subpleural nodules projected from the surface and a few on the dorsal mediastinal surface were mushroomed.

On the ventral surface of the caudal lobes along the lines of the interlobular septa there were several clusters of flattened grey tubercles with yellow centres bound together by reddish connective tissue.

The Bronchial and Mediastinal Glands—Were moderately enlarged and together weighed 5 ozs; on section the cortices were composed throughout of dense yellow caseated tissue showing here and there foci of congestion and in one or two of the glands minute islets of grey translucent tissue.

Pleura.—On the pleural surface of the diaphragm there was a moderate number of flattened nodules, the largest 2 mm., with yellow caseous centres; they occurred chiefly in small groups. On the caval fold of pleura there were several patches of firm reddish vegetations and a few discrete tubercles. Along the margins of the ribs there were continuous rows of reddish vegetations containing small tubercles.

Larynx.—Normal.

Trachea.—The mucous membrane in the anterior part showed a few congested caseous foci.

Abdomen :

Omentum.—The lymphatic fringes on the ventral surface of the omentum were congested and slightly hypertrophied and contained scattered reddish tubercles, the largest the size of a millet seed, some with yellow centres.

Parietal Peritoneum.—On the peritoneum near the margin of the ribs on the right side there was a lenticular nodule 5 mm. in diameter. The peritoneum covering the tendon of the diaphragm showed two patches of soft pinkish connective tissue and a number of small tubercles running parallel to the fibres of the tendon.

The Spleen weighed 4 ozs. and showed on section a moderate number of firm yellow caseous nodules with narrow grey margins ranging in size from a hemp seed to a small pea (4 mm.); the subcapsular nodules caused slight projections and the capsule over them was slightly thickened and adherent.

The Liver showed on the surface moderately numerous nodules; a few of these were raised above the surface and had filmy grey margins, the largest measuring about 5 mm. in diameter; other nodules projected only slightly or were dimly seen through the capsule; on section the nodules were yellow and caseous and had narrow grey margins; similar nodules were evenly distributed throughout the substance.

Gall Bladder.—Normal.

The Portal Glands were enlarged, indurated and showed on section irregular yellow caseous patches surrounded by translucent fibroid tissue.

Kidneys.—The left kidney showed in the cortex a considerable number of pale grey foci, the largest the size of a pin's head; there were similar foci in the right kidney and also one or two larger ones with slightly opaque centres.

The Right Suprarenal Body showed in the cortex a yellow caseous nodule the size of a hemp seed.

Left Suprarenal Body.—Normal.

Alimentary Tract :

Tongue, Pharynx and Left Tonsil.—Normal.

The Right Tonsil contained one softened caseous nodule.

Small Intestine.—In the lower part of the ileum there were numerous caseous nodules ranging up to a hemp seed in size the majority of which were ulcerated; the rest of the small intestine appeared normal.

Large Intestine.—Several lymphoid follicles in the large intestine were enlarged and ulcerated, and showed in the centre some soft caseous substance.

Gastric Glands.—Two or three gastric glands were enlarged and composed of translucent grey tissue mottled with yellow caseous patches; others contained discrete caseous nodules.

Mesenteric Glands.—The glands at each extremity of the mesentery were slightly enlarged and showed their cortices extensively replaced by dense yellow caseous areas; other mesenteric glands contained discrete caseating nodules of various sizes.

Various Lymphatic Glands :

The Cœliac Glands were enlarged and showed on section yellow caseous areas surrounded by translucent fibroid tissue.

Lumbar Glands.—One lumbar gland showed the whole of the cortex composed of grey caseating tissue; the rest contained discrete caseating nodules.

The Left Precrural Gland contained a hemp seed sized caseous nodule; the other was normal.

One Pudic Gland contained a pea-sized caseous nodule; the other was normal.

Each Popliteal Gland contained a hemp seed sized caseous nodule.

The Right Gluteal, the Left Ischiatic, the Left Iliac and an Ilio-Sacral Gland each contained two or three firm yellow caseous nodules, the largest 4 mm. in diameter.

The Right Iliac, the Left Gluteal and the Right Ischiatic Glands were normal.

Axillary Glands.—Normal.

The Left Submaxillary Gland showed a yellow caseous mass replacing nearly half the substance and a group of small caseous tubercles.

The Right Submaxillary Gland was normal.

The Right Retro-Pharyngeal Gland was enlarged and its substance extensively replaced by large yellow caseous nodules.

The Left Retro-Pharyngeal Gland contained three caseous nodules, the largest the size of a pea. Here and there a hæmolymph gland was seen to contain a caseous nodule.

Eyes.—Normal.

Testicles.—Normal.

CALF 422.

Subcutaneous inoculation of culture derived from the original material of Virus B XXVI.

Dose—50 milligrammes.

Date—June 5th, 1906.

Weight—2 qrs. 19 lbs.

Died—July 19th, 1906. 44 days after inoculation.

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 5th, 1906.

On the next day there was a slight subcutaneous thickening 1½ in. in diameter. On the fourth day there was a slightly raised thickening measuring 3 in. by 1¾ in. in superficial area.

On June 16th, 11 days after inoculation, there was a large infiltrating tumour moulded to and partly surrounding a large prescapular gland.

On June 26th, three weeks after inoculation, the tumour measured 6 in. by 4 in. and between 1 and 2 in. thick; no change as yet had been observed in the general health.

On July 4th, 1906, 31 days after inoculation, the respirations were observed to be a little increased in frequency.

On July 6th, 1906, the respirations were definitely increased and the calf was obviously ill (rough coat, depression, etc.). It gradually got worse and lost flesh and strength. The respirations became only moderately increased in frequency and were never laboured.

The appetite remained good until towards the end of the experiment.

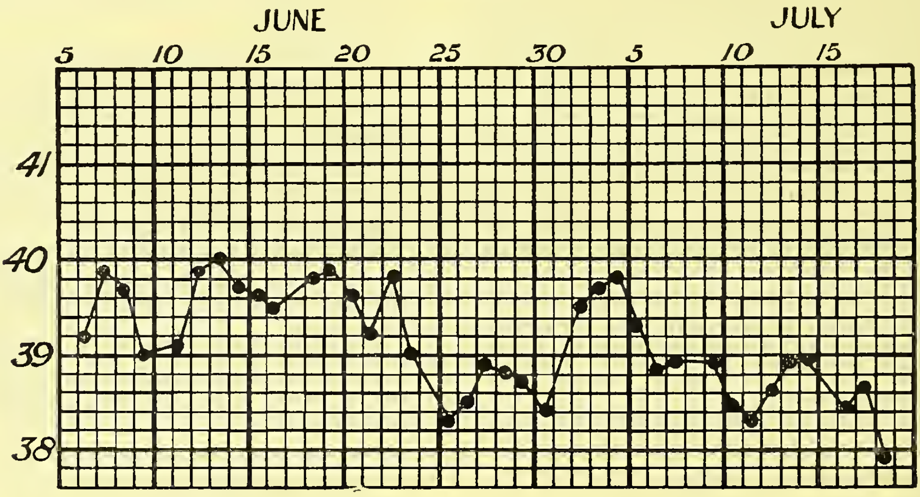
Weight.

There was a gain in weight of 1 lb. in the first 20 day and a loss of 13 lbs. in the last 24.

	qrs.	lbs.
June 5th, 1906	2	19
June 25th, 1906	2	20
July 19th, 1906	2	7

Loss in weight.—12 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Poor.

Local Lesion.—On the left side of the neck there was a somewhat flattened tumour measuring 6 in. by 4 in by 1¾ in. in greatest thickness; in the centre of the external surface there was a deep irregular ulcer, 1½ in. in greatest diameter, which communicated with a flattened space in the middle of the tumour lined with soft brownish necrotic material; on section the tumour was found to be composed of the usual dense yellow caseo-necrotic tissue, adherent to the skin and infiltrating the muscles; the intact skin was congested and a little thickened and beset with small yellow tubercles.

The Left Prescapular Gland weighed 4 ozs., and measured 3½ in. by 2½ in. by 1¾ in.; on section the greater part of the cortex was composed of dense pinkish yellow caseous tissue whilst the rest was closely beset with yellow caseous tubercles; the capsule of the gland was a little thickened.

The Right Prescapular Gland.—Not enlarged, contained a number of caseous nodules, occurring chiefly in groups.

Prepectoral Glands.—On the left side the spherical gland was the size of a large pea and showed a few caseous foci in the cortex; the reniform gland was enlarged; one part of the cortex was firmer than normal and speckled with caseous points; in the rest of the gland there were a few discrete caseous nodules; another gland near the latter was slightly enlarged and showed a few early caseous foci.

The Right Prepectoral Glands.—Contained discrete caseous nodules, the largest the size of a hemp-seed.

Cervical Glands.—On the left side one a few inches from the thorax, 1 cm. in greatest diameter, was indurated and showed yellow caseous nodules closely set around the cortex; a gland, just within the entrance to the thorax, the size of a pheasant's egg, was composed practically throughout of dense yellow caseated tissue; the upper cervical gland contained three caseous nodules. The glands on the right side were slightly enlarged; each contained a few caseous nodules, similar to those in the peripheral glands.

Thorax:

The Lungs.—Were enlarged and mottled on the surface with irregular dark red patches of consolidation; these patches were most numerous in the left lung and caused almost complete consolidation of the ventral half of the cephalic and the antero-ventral portion of the caudal lobes.

The parenchyma of the lung was closely and evenly beset with yellow caseous tubercles, ranging in size from a pin's head to that of a hemp-seed; the subpleural tubercles, except on the the dorsal surface of the caudal lobes, caused projections from the surface. Scattered about the substance of each of the lobes were solid caseating masses occupying a part or the whole of the lobule.

The Bronchial and Mediastinal Glands.—Were enlarged and weighed together 4 ozs.; on section the cortices were composed throughout of a dense grey translucent tissue closely beset with small irregular yellow caseous patches (these glands resembled the portal and cœliac glands, but were perhaps a little more advanced in caseation).

A small gland in the ventral mediastinal fold of pleura near the apex of the heart, and the ventral mediastinal glands, contained yellow caseous nodules similar to those in the peripheral lymphatic glands.

Pleura.—The fringes along the margins of some of the ribs were congested and contained small grey tubercles occurring chiefly in clusters.

The pleura covering the diaphragm showed a few groups of small tubercles.

Heart.—Normal.

Abdomen :

The Omentum.—Showed on its inferior surface about half-a-dozen lenticular nodules, yellow in the centre, ranging in size from a pin's head to a wheat grain.

Peritoneum.—Normal.

The Spleen.—? Enlarged, weighed about 6½ ozs; there were no tubercles on the surface; the pulp contained moderately numerous firm yellow caseous nodules ranging in size from a millet to a hemp seed.

The Liver.—Was normal in general appearance; on the surface sparsely scattered caseating tubercles were seen varying in size from a mere point up to that of a millet seed; the larger tubercles were slightly raised above the surface and some had filmy grey margins; on section small caseous tubercles up to a pin head in size were very sparsely scattered throughout the substance.

Gall-bladder.—Normal.

The Portal Glands.—Were considerably enlarged and showed on section the cortices closely beset with irregular yellow caseous nodules embedded in a firm grey translucent matrix.

Kidneys.—Each kidney showed in the cortex sparsely scattered caseous tubercles, with grey margins, the largest a little larger than a millet seed; the larger ones were elongated in a radial direction.

The Right Suprarenal Body.—Contained one opaque yellow miliary tubercle.

The Left Suprarenal Body.—Was normal.

Tonsils.—The left tonsil contained one caseous nodule; none seen in the right.

Tongue, Pharynx, Larynx and Trachea.—Normal.

The Thymus.—Contained a millet seed-sized caseous tubercle.

Small Intestine.—In the long Peyer's patch there were fairly numerous caseous tubercles, the largest the size of a millet seed; in the rest of the intestine tubercles were very sparsely scattered.

Large Intestine.—Normal.

Eyes.—Normal.

Testicles.—Normal.

Various Lymphatic Glands :

The Submaxillary, Retro-pharyngeal, Parotid and Mastoid Glands.—Were slightly enlarged and contained numerous irregular firm yellow caseous nodules up to 4 mm. in diameter.

Axillary Glands.—The right contained several caseous nodules; in the left there was only one.

Cœliac Glands.—One cœliac gland was very large and on section resembled the portal glands; a smaller gland showed yellow caseous nodules becoming confluent.

The Renal and Lumbar Glands.—Were enlarged and closely beset with yellow caseous nodules.

The Iliac, Ilio-Sacral, Precrural, Pudic, Popliteal and Gluteal Glands.—Showed a varying number of discrete yellow caseous nodules, irregular in outline, ranging up to 2 and 3 mm. in diameter.

The Mesenteric Glands.—Contained similar caseous nodules, in several aggregated together to form larger nodules; the gastric, ileo-colic and colic glands resembled the mesenteric.

Ischiatic Glands.—Normal.

Microscopical Examination (Smear Preparations).

Small Intestine.—Numerous tubercle bacilli.

RHESUS MONKEY 148.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI.

Date—June 6th, 1906.

Dose—10 milligrammes.

Weight at Death—1,400 grammes.

Died—July 11th, 1906. 35 days after inoculation.

Clinical History.

The monkey was inoculated subcutaneously over the right scapula.

A prominent hemispherical swelling developed, the skin over which soon broke down.

On June 26th, 1906, 20 days after inoculation, there was a flat slightly raised thickening 2 in. by 1½ in. the skin in the centre of which showed a deep ulcer with hæmorrhagic margins and floor covered with caseo-pus. The right axillary glands were much enlarged.

The monkey became ill about July 3rd, 1906; the coat was rough and the animal was quieter; he gradually got worse and lost appetite and flesh, but not to any marked extent; during the last few days of life the eyelids were œdematous; the respirations were never appreciably increased in frequency.

POST-MORTEM EXAMINATION.

Body.—In poor condition.

Local Lesion.—Over the lower part of the right scapula there was a circular ulcer, 1 in. in diameter, the floor of which was covered with dried caseo-pus; the ulcer was surrounded by a slightly raised zone one third of an inch in diameter; on radial section the tissues underneath the raised zone were found to be caseous and softened towards the ulcer; the edges of the ulcer were thinned, inverted and undermined; on removal of the caseous scab the floor was found to be granular and covered with soft caseo-pus; the base was composed of fibroid muscular tissue, ¼ in. in greatest thickness, beset with yellow caseous nodules.

Axillary Glands.—In the right axilla there was an irregular mass of enlarged glands measuring roughly 2 in. by 1 in. by ½ in.; on section the glands composing the group were yellow and caseous throughout and beginning to soften around the periphery; the capsules were thickened and adherent together. On the left side the glands were not apparently enlarged; two contained each one firm yellowish white caseous tubercle, the size of a millet-seed.

Cervical Glands.—Between the outer part of the right clavicle and the trapezius there was a series of three glands, the largest 1 cm. in greatest diameter; the latter was composed throughout of soft yellow caseous substance; the other two were caseous almost throughout; a few small glands around these contained a few discrete caseous tubercles.

A gland behind the outer part of the left clavicle contained a millet seed-sized caseous tubercle. Other cervical glands were normal.

Thorax:

The Lungs.—Were normally crepitant; the right lower lobe contained four shotty tubercles, ranging in size from a pin's head to that of a millet seed, with caseous centres and grey margins; in the right, middle, and right upper lobes no tubercles were seen; there was one tubercle in the left upper lobe and two tubercles in the left caudal.

The Bronchial Glands.—Appeared normal.

Heart.—There was a slight excess of fluid in the pericardial sac; heart, muscle and valves, normal.

Vertebral Glands.—One in the eighth intercostal space on the right side, the size of a split pea, was caseous throughout; a smaller gland in a neighbouring space contained a millet seed-sized caseous tubercle.

On the left side a gland in the ninth space showed a few minute caseous points.

A gland behind the manubrium sterni contained a minute caseous tubercle.

Abdomen:

The Peritoneal Cavity contained a small quantity of clear fluid.

The Omentum showed fairly numerous discrete tubercles, varying in size up to that of a small pin's head; the larger ones were pearly white; the smaller ones glassy or slightly opaque in the centre.

The *Spleen* was enlarged (2¼ in. by 1¼ in. by ⅝ in.), and was slightly adherent to the peritoneum covering the left kidney; it showed on the surface under the capsule numerous yellowish white nodules, which projected from the surface; on section the pulp was packed with caseous nodules, varying in size up to 7 or 8 mm. in diameter; the latter were softened and appeared to be composed of several smaller nodules which had fused together.

One Splenic Lymphatic Gland.—Contained a pinhead-sized caseous tubercle.

The Liver.—Was enlarged, pale and very closely beset with firm opaque whitish tubercles ranging in size from a point just visible to the eye up to about 2 mm. in diameter.

The Portal Gland.—Was much enlarged and closely beset with soft yellow coalescing caseous nodules, the largest the size of a hemp seed.

Two Cœliac Glands.—Were moderately enlarged and contained similar nodules.

The Kidneys.—Were very pale and speckled with petechial hæmorrhages: they showed in the cortex, on the surface as well as on section, opaque whitish caseous tubercles ranging in size from a mere point up to 1·5 mm. in diameter. In the right kidney there were two rather larger nodules, one of which was elongated in a radial direction.

Suprarenal Bodies.—Normal.

Stomach and Intestines.—Normal.

Gastric Glands.—A gland in the lesser curvature of the stomach contained three caseous pinhead-sized tubercles

Mesenteric Glands.—Not apparently enlarged, contained three soft caseous nodules ranging in size from a millet to a hemp seed.

The Ileo-colic and Colic Glands.—Were normal.

The Left Iliac Gland.—Contained a caseous nodule the size of a hemp seed.

The Right Iliac, Ileo-sacral and Lumbar Glands.—Were normal.

The Right Pharyngeal Gland.—Contained a pin-head-sized caseous tubercle.

The Right Parotid Lymphatic Gland.—Contained a soft caseous nodule the size of a hemp seed.

The Left Pharyngeal, Left Parotid and Right and Left Submaxillary and Submental Glands.—Were normal.

The Left Precrural Gland.—Contained a soft caseous tubercle the size of a millet seed. The right precrural and inguinal glands were normal.

Testicles.—Normal.

Brain.—There was an effusion of blood under the pia mater covering the left parietal lobe; the substance of the brain was normal.

Microscopical Examination (Smear Preparation).

Kidney Tubercle.—Moderate number of tubercle bacilli.

RHESUS MONKEY 146.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI.

Date—June 6th, 1906.

Dose—1·0 milligramme.

Weight at Death—1,540 grammes.

Died—July 21st, 1906. 45 days after inoculation.

POST-MORTEM EXAMINATION.

Body.—In poor condition.

Local Lesion.—On the right scapula there was an irregular ulcer, about 1 in. in greatest diameter, with thinned undermined margins coated with dried blood-stained discharge, and with caseous hæmorrhagic floor and fibroid base closely studded with yellow caseous tubercles each about the size of a millet-seed.

Axillary Glands.—In the right axilla there was a group of half-a-dozen glands, the largest the size of a kidney bean; five of the glands were composed throughout of yellow caseous substance, in some partially converted into caseo-pus; the sixth gland, the smallest, was caseous around the cortex only.

One of the glands in the left axilla contained a soft caseous tubercle, the size of a pin's-head.

Cervical Glands.—In the right posterior triangle under the trapezius there was a gland, 1 cm. in diameter, caseous and softened throughout; three smaller glands, internal to the latter, behind the clavicle, were partly caseous.

Other cervical glands on this side, as well as those on the left, were normal.

One left submaxillary gland and two glands on the left parotid salivary gland contained each a caseous and softened tubercle the size of a millet-seed.

The corresponding glands on the right side and the retro-pharyngeal glands were normal.

Thorax :

The right pleural cavity contained a quantity of clear serous fluid.

Lungs.—The right lower lobe was lightly adherent to the chest wall and was covered on its dorsal surface with a layer of organised fibrin which readily peeled off; the left lower lobe was slightly adherent on its dorsal surface.

The right middle lobe was almost completely collapsed; the other lobes on this side showed small dark-red patches of collapse. The lobes on the left side were crepitant.

Both lungs contained fairly numerous firm caseous nodules, with narrow grey margins,ranging in size from a pin's head to that of a pea; the larger ones were somewhat irregular in outline, the subpleural ones projecting from the surface.

The Bronchial Glands.—Were slightly enlarged; one on the right side was caseous almost throughout; the others contained discrete caseous nodules.

The Pericardium.—Contained an excess of clear fluid.

Heart.—Normal.

Vertebral Glands.—One of the mid vertebral glands on the right side was enlarged and caseous; another in a neighbouring space showed a minute caseous focus.

Pleura.—There were no tubercles on the pleura.

Abdomen :

The Peritoneal Cavity contained a quantity of yellow serous fluid.

The Omentum. — Showed numerous discrete tubercles ranging in size from a point just visible to the eye up to that of a millet seed; the larger tubercles were opaque and caseous throughout; the medium-sized ones were caseous in the centre; the smaller ones were transparent or translucent. There was one millet seed sized caseous tubercle on the mesentery.

The Meso Colon showed three or four caseous tubercles besides a number of minute grey granules.

The Parietal Peritoneum on the right side where in contact with the liver showed a number of miliary caseous tubercles.

The Spleen.—Was enlarged (2¼ in. by 1 in. by ¾ in.) and nodular on the surface; on section the pulp was very closely beset with yellow caseous nodules, ranging in size from a millet seed to that of a large pea; the larger nodules were distinctly softened in the centre.

Three small glands in the gastro-splenic omentum contained discrete caseous tubercles, largest 1 mm. in diameter.

The Liver.—Was enlarged, pale and adherent to the wall of the abdomen by more or less recent adhesions; the substance was crowded with tubercles and nodules of all sizes up to that of a pea; the majority of these were firm, opaque, white, and caseous; some of the larger nodules, however, were softened and in several instances filled with a greenish mucoid substance, whilst the smaller foci were greyish-white and translucent.

On the capsule of the liver there were numerous small pearly tubercles.

The Portal Gland and several glands around the head of the pancreas were enlarged and advanced in caseation.

Some smaller glands along the upper border of the pancreas contained discrete miliary caseous tubercles.

Kidneys.—In the cortex of the right kidney there were about a dozen caseous tubercles ranging in size from 0·5 to 2 mm. in diameter. The left kidney tained similar tubercles ranging up to 2·5 mm.

Suprarenal Bodies.—Normal.

Tongue, Pharynx, Tonsils, Larynx, and Trachea.—Normal.

Intestines.—The mucous membrane of the small intestine showed several small ulcers with thickened base and margins.

Mesenteric Glands.—Not obviously enlarged, contained a few caseous nodules ranging in size from a millet to a hemp seed.

Colic Glands.—Two contained each a millet-seed-sized caseous tubercle, and another showed a minute caseous focus.

Lumbar Glands.—One on the right side had its substance almost completely replaced by caseous nodules; in one on the left side there was a millet seed sized caseous tubercle.

Iliac Glands.—Normal.

The Right Inguinal Glands contained two soft, yellowish-white caseous nodules, the largest the size of a hemp-seed.

An Inguinal Gland on the left side contained three caseous nodules.

RHESUS MONKEY 144.

Subcutaneous inoculation of culture derived from the original material of Virus B XXVI.

Dose—0·1 milligramme.

Date—June 6th, 1906.

Weight at Death—1,770 grammes.

Killed—When very ill, August 1st, 1906. 56 days after inoculation.

POST MORTEM EXAMINATION.

Condition.—Fair ; there was well-marked œdema of the subcutaneous tissues along the mid-line of the abdominal wall.

Local Lesion.—On the right scapula there was a tuberculous ulcer measuring 1¼ in. by ¾ in., with irregular undermined margins and thin fibroid base ; the floor of the ulcer was formed by pinkish granulation tissue and showed under the skin around the margins some soft caseous substance. In the subcutaneous tissues close to the inferior margin of the ulcer there was a small flattened fibroid patch closely beset with caseous nodules, the largest the size of a hemp-seed.

Axillary Glands.—The glands on the right side were much enlarged and on section composed of yellowish white caseous substance, in two of the glands beginning to soften around the periphery. The capsules of the glands were thickened and adherent together.

On the left side one axillary gland contained two minute caseous tubercles ; another contained a soft caseous nodule the size of a hemp-seed ; the rest were normal.

Cervical Glands.—Those on the right side appeared normal. On the left side one in the middle of the neck contained a caseous nodule the size of a hemp-seed.

A Submaxillary Gland.—On the right side contained a similar but slightly smaller nodule. Other glands in the neck were normal.

Inguinal Glands.—Two on the left side showed each an opaque white miliary caseous tubercle ; those on the right side were normal.

Abdomen :

The Abdominal Cavity.—Was filled with clear serous fluid.

The Omentum.—Contained numerous tubercles varying in size from a mere point up to that of a millet seed ; the larger tubercles were entirely caseous ; the medium-sized ones caseous in the centre, the smaller ones quite transparent.

There were several yellow caseous tubercles on the peritoneal surface of the diaphragm, a few on the mesocolon and one in the right lumbar region.

The Spleen.—Was much enlarged, measuring 2½ in. by 1¾ in. by 1 in., and was firmly adherent to the wall of the abdomen just above the right kidney ; projecting from the surface were numerous yellow nodules; between these nodules the capsule showed numerous flattened tubercles, which along the superior margin and around the upper extremity formed a continuous layer. On section the pulp was found to be closely filled with yellow caseous nodules, ranging in size from 2 up to about 8 mm. in diameter, which at the upper extremity completely replaced the spleen pulp. All the nodules were softened in the centre the larger ones being purulent.

Some small glands in the hilum of the spleen contained caseous nodules.

Liver.—The liver was enlarged and adherent in several places to the diaphragm ; the substance showed numerous yellowish white caseous nodules ranging in size from a pin's head to that of a hemp-seed and tending to occur in small groups ; there were besides extremely numerous greyish-white foci varying from 0·5 mm. to a point just visible to the naked eye : in one lobe just under the capsule there was an irregular caseous patch measuring 1 in. by ½ in. by ¼ in.

The Portal and Cœliac Glands.—Were enlarged and showed their cortices extensively replaced by softened caseous nodules.

Kidneys.—The left kidney showed in the cortex fairly numerous opaque whitish tubercles the largest the size of a pin's head. The right kidney contained similar tubercles and one rather larger one the size of a millet-seed.

Suprarenal Bodies.—Normal.

Thorax :

There was a slight excess of fluid in each pleural cavity.

Lungs.—The lungs collapsed normally ; the left caudal lobe showed a few fibrous adhesions to the diaphragm ; the right was free from adhesions. The parenchyma of the lungs contained a moderate number of evenly distributed nodules ranging in size from a millet to a hemp seed ; the nodules were firm and caseous and had grey translucent margins. In the thin ventral margin of the right lobes and the ventral tip of the left cephalic there were some small irregular patches of collapse.

Bronchial Glands.—A left bronchial gland, slightly enlarged, contained half-a-dozen caseous nodules ranging in size from a pin's head to that of a hemp seed. One on the right side contained a pin-head-sized caseous tubercle.

One Intertracheo-Bronchial Gland.—Contained a millet seed sized caseous tubercle ; the rest were normal.

Mediastinal Glands.—In the dorsal mediastinal fold of pleura, near the latter glands there were two glands, one 1 cm. in diameter, the other the size of a hemp seed, both of which were caseous throughout.

On the last dorsal vertebræ near the diaphragm there was a slightly enlarged gland showing a number of caseous foci.

Vertebral Glands.—In the eighth space near the vertebral column on the right side there was a caseous and softened gland nearly 1 cm. in diameter ; in the ninth space there was a similar but smaller gland ; in the tenth there was a slightly enlarged gland beset with miliary caseous tubercles. A slightly enlarged gland in the tenth space on the left side contained a few caseous foci.

Pleura.—There were no tubercles on the costal pleura ; on the diaphragmatic pleura around the margin of the tendon there were about ten yellow caseous tubercles, the largest a little larger than a millet seed.

Under the pleura in the middle of the eighth right intercostal space there was a millet seed sized caseous tubercle.

Heart.—There was a slight excess of fluid in the pericardial sac. Heart, muscle and valves normal.

Tongue, Pharynx and Tonsils.—Normal.

Intestines.—Normal.

Gastric Glands.—A gland just above the pylorus, the size of a large pea, was caseous throughout ; a small gland in the lesser curvature was partly caseous.

Mesenteric, Ileo-Colic and Colic Glands.—Normal.

The Lumbar Glands.—Were enlarged ; one pea-sized one was caseous throughout ; the others showed soft caseous nodules around the cortex.

Iliac Glands.—One on the left side contained two pin-head sized caseous tubercles ; the others were normal.

Brain and Meninges.—Normal.

Uterus and Ovaries.—Normal.

Microscopical Examination. (*Smear Preparation.*)

Caseous Patch in Liver.—A few tubercle bacilli.

RHESUS MONKEY 142.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI.

Date—June 6th, 1906.

Dose—0·001 milligramme.

Weight at Death—1,540 grammes.

Died—July 21st, 1906. 45 days after inoculation.

POST-MORTEM EXAMINATION.

Body.—In poor condition.

Local Lesion.—On the right scapula there was a tumour, lenticular in outline, measuring 1½ in. by 1½ in. by about ½ in. in greatest thickness, composed of yellow caseous substance softened towards the centre. The skin over the central part of the tumour was necrotic and ulcerated and covered with dried caseo-pus.

Axillary Glands.—In the right axilla there were two masses, the largest the size of a broad bean, composed of two or three glands fused together, which on section were found to be caseous and softened practically throughout; a smaller separate gland showed an irregular caseous nodule and several caseous foci. Two glands in the left axilla contained each a miliary soft caseous tubercle.

Cervical Glands.—Behind the outer part of the right clavicle there was a series of four enlarged glands, the largest 1 cm. in diameter; on section three of the glands were caseous and softened throughout; the fourth, placed most internally, was beset with small caseous tubercles.

Of the glands in the posterior triangle on the left side one contained a single soft caseous tubercle the size of a millet seed.

The other cervical glands were normal.

Thorax :

Each pleural cavity contained a small quantity of clear fluid. The pleura was normal.

The Lungs.—Were pinkish and crepitant and free from adhesions; they contained sparsely scattered shotty tubercles, up to a millet seed in size; the larger ones were opaque and white; the smaller ones grey with opaque centres.

Bronchial Glands.—One intertracheo-bronchial gland on the left side, the size of a French bean, was caseous throughout. The other bronchial glands, not apparently enlarged, contained each one or two small caseous nodules.

Heart.—The pericardial sac contained a slight excess of fluid. Heart muscle and valves normal.

Sternal Glands.—The right sternal gland contained a millet seed-sized caseous tubercle. The left was normal.

Vertebral Glands.—Two on the right side in the middle intercostal spaces, the size of split peas, were caseous throughout.

Abdomen :

The Peritoneal Cavity.—Contained a large amount of clear serous fluid.

The Omentum.—Showed a few scattered caseous tubercles, the largest the size of a millet seed.

The Parietal Peritoneum.—Showed several small patches of hæmorrhage; there were no tubercles.

The Spleen.—Was closely and evenly beset with opaque yellowish white caseous nodules, ranging in size from 1 to about 3 mm. in diameter, the larger of which were softened in the centre.

One Splenic Lymphatic Gland.—Was slightly enlarged and showed caseous nodules around the cortex.

The Liver.—Was adherent to the parietal peritoneum by recent fibrin. The substance of the liver was paler than normal and contained numerous caseous tubercles ranging in size from a mere point to that of a hemp seed; the larger tubercles were distinctly yellow in the centre.

Around the head of the pancreas there were several enlarged glands which were caseous throughout and beginning to soften.

Kidneys.—In the right kidney there were three caseous tubercles the largest the size of a pin's head; the left kidney appeared normal.

Suprarenal Bodies.—Normal.

Tongue, Tonsils, Pharynx, Larynx and Trachea.—Normal.

Intestines.—Normal.

The Mesenteric Glands.—Contained three or four caseous nodules the largest 2 mm. in diameter.

There was a caseous nodule in an ileo-colic gland.

Colic Glands and Iliac Glands.—Normal.

The Lumbar Glands.—On the right side were enlarged, fused together and caseous throughout; one on the left side contained two miliary caseous tubercles.

Ilio-sacral Glands.—Two contained small caseous nodules.

The Left Retro-Pharyngeal Gland.—Contained a small caseous tubercle. The right retro-pharyngeal gland, the submaxillary and parotid glands were normal.

Two Right Inguinal Glands.—Contained each a caseous nodule a little larger than a millet seed.

The Left Inguinal Glands.—Were normal.

Brain and Meninges.—Normal.

VIRUS B XXVII.

September 1, 1905.

DIAPHRAGM.

The specimens were taken from a calf about four months old which was considered by Mr. King to be suffering from congenital tuberculosis.

The peritoneal surface of the diaphragm was covered with firm flattened growths 8 to 9 mm. thick, composed of dense translucent tissue, showing in the centre yellow gritty foci.

There were numerous small "perlsucht" growths on the surface of the spleen and a few grey miliary tubercles in the pulp, some with opaque centres.

The lung substance and the liver substance were normal; each showed on the surface growths similar to those on the diaphragm. An enlarged mediastinal gland was beset in the cortex with small irregular yellow gritty foci.

An iliac gland was normal.

CULTURE INOCULATIONS.

VIRUS B XXVII.

(September 1, 1905.)

DIAPHRAGM.

RABBITS.

Inoculated on October 26, 1905, with culture derived from the original material.

The culture used was the 4th generation ; 21 days old.

The total age of culture was 56 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
501 - - - -	0·1 mg.	Intravenous	D. 20 days	G.T.
499 - - - -	1·0 mg.	Intraperitoneal	D. 21 „	G.T.
500 - - - -	1·0 mg.	Intraperitoneal	D. 18 „	G.T.
504 - - - -	0·1 mg.	Intraperitoneal	D. 27 „	G.T.
502 - - - -	0·01 mg.	Intraperitoneal	D. 65 „	G.T.
503 - - - -	1·0 mg.	Subcutaneous	D. 114 „	G.T.

No Calves were inoculated with this virus.

VIRUS B XXVIII.

January 15, 1906.

BUTCHER'S MEAT.

The material, a tuberculous lymphatic gland, was taken from a mass of fat supplied with a joint of beef to one of the laboratory assistants. Two tuberculous glands were found in the fat; one contained a small calcareous tubercle; the other some rather larger calcareous nodules; the culture used for experiment was raised from the former.

VIRUS B XXVIII.

(January 15, 1906.)

? MEDIASTINAL GLAND.

PIGS.

Inoculated on June 1, 1906, with culture derived from the original material.
The culture used was the 6th generation ; 21 days old.
The total age of the culture used was 137 days.

PIG 156.

Subcutaneous.
Dose : 10 mg.
Killed, August 21, 1906.
(81 days.)
P.M.—General tuberculosis ; lungs verely affected.

PIG 158.

Subcutaneous.
Dose : 1·0 mg.
Died, July 19, 1906.
(48 days.)
P.M.—General tuberculosis.

PIG 160.

Subcutaneous.
Dose : 0·1 mg.
Killed, August 23, 1906.
(83 days.)
P.M.—General tuberculosis.

RABBITS.

Inoculated June 1, 1906.
The culture was the 6th generation ; 21 days old.
The total age of the culture was 137 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
892	1·0 mg.	Intravenous	D. 11 days	G.T.
893	0·1 mg.	„	D. 12 „	G.T.
894	1·0 mg.	Intraperitoneal	D. 12 „	G.T.
895	0·1 mg.	„	D. 16 „	G.T.
896	0·01 mg.	„	D. 47 „	G.T.
897	1·0 mg.	Subcutaneous	D. 4 „	Psorospermosis.
898	0·1 mg.	„	D. 70 „	G.T.

CATS.

Inoculated June 1, 1906.
The culture was the 6th generation ; 21 days old.
The total age of the culture was 137 days.

Number of Cat.	Age.	Dose.	Methods of Inoculation.	Duration of Life.	Result.
84	Young	1·0 mg.	Subcutaneous	D. 21 days	G.T.
80	„	0·1 mg.	„	D. 34 „	G.T.
82	„	0·01 mg.	„	D. 39 „	G.T.
78	Adult	1·0 mg.	„	K. 74 „	G.T.
76	„	0·1 mg.	„	D. 22 „	G.T.

PIG 156.

Subcutaneous inoculation of culture derived from the original material of Virus B XXVIII.

Dose—10 milligrammes.

Date—June 1st, 1906

Initial Weight—36 lbs. Final weight, 49 lbs.

Killed—August 21st, 1906. 81 days after inoculation.

POST-MORTEM EXAMINATION.

Local Lesion.—In the skin of the abdomen on the right side there was an irregular superficial dry ulcer 1 in. by $\frac{2}{3}$ in.; on section the subcutaneous tissues showed a thin patch of fibrous tissue, about 2 in. in greatest diameter, closely beset with caseous tubercles, some just perceptibly gritty, the largest the size of a millet-seed; there were besides two or three small caseous nodules; extending from this patch in a direction towards the right precrural gland there was a thickened lymphatic vessel the lumen of which was patent and surrounded by pinkish tissue. In the subcutaneous tissues between the local lesion and the inguinal glands there was a caseous nodule, the size of a small bean, with a fibrous capsule; the caseous substance was firm, slightly gritty and could be readily shelled from its capsule.

Superficial Inguinal Glands.—On the right side the one nearest the lesion, not apparently enlarged, showed an irregular caseous nodule about the size of a pea and a few irregular discrete caseous tubercles. A rather larger gland more posterior showed about half the substance replaced by a dense yellow caseous and slightly gritty mass. Two other glands in this group were normal.

The glands on the left side were normal.

Precrural, Iliac and Lumbar Glands.—Normal.

Thorax:

Heart.—Normal.

Pleura.—On the costal pleura, chiefly in the anterior part, there was a number of flattened pinkish growths, up to 1 cm. in diameter, composed apparently of agglomerations of small tubercles; on section the tubercles were greyish white, and some had yellow points in the centre; there were besides several single nodules, some hæmorrhagic, ranging in size up to that of a hemp seed; these nodules were attached to the pleura by strands of connective tissue which varied in length.

On the pleural surface of the diaphragm there were several loosely attached nodules; these were firm and greyish white on section and some were opaque in the centre; near the caval fold of pleura there were several groups of small tubercles, some slightly opaque in the centre, bound together by reddish connective tissue.

Lungs.—The lungs were enlarged, heavy, and did not collapse; the surface was studded with hard raised greyish nodules up to a hemp seed in size, the larger of which were yellow, caseous, and gritty in the centre; the nodules were very thickly set on the contiguous surfaces of the small anterior and caudal lobes, and were very numerous on the ventral surface of the caudal lobes, but not so numerous in other parts. There were besides several pinkish mushroomed growths, most of which appeared to be associated with nodules in the substance of the lung; attached to the surface of these growths were numerous delicate strands of connective tissue (except along the dorsal borders).

The cephalic lobes, the right middle lobe and the antero-ventral portions of the caudal lobes were firm, fleshy and quite airless; on section the lobules were composed of a firm pinkish grey tissue containing here and there yellow calcareous foci (pinhead sized); the cut surface closely resembled pancreas; three of the lobules at the margin of the right middle lobe were extensively caseous and softened. On section of the crepitant portions of the lung the parenchyma was found to be closely beset with miliary tubercles with caseo-calcareous centres; they were surrounded in many of the lobules by irregular greyish patches which diffusely infiltrated the lung substance.

In the fringes around the margins of the caudal lobes were scattered hard nodules, the largest nearly the size of a hemp seed.

Around the margins of the cephalic lobes there were in places continuous rows of aggregated hard grey tubercles, some with yellow centres.

Bronchial Glands.—The glands on each side were moderately enlarged and felt firmer than normal; on section they showed irregular gritty caseous patches and foci embedded in a firm gland-like tissue. A ventral mediastinal gland on the right side, the size of a hazel nut, showed about three-quarters of its substance composed of yellow gritty caseous substance.

Abdomen:

Omentum.—Normal.

Peritoneum.—The peritoneum covering the right side of the diaphragm showed about twenty hard raised pearly grey nodules the largest the size of a hemp seed. Elsewhere the peritoneum was normal.

Spleen.—Not enlarged, showed on the convex surface numerous projecting nodules the largest 4 mm. in diameter; the nodules were grey and translucent and had minute yellow gritty centres; on section the pulp contained similar nodules somewhat irregularly distributed; they were most numerous in the thickest part of the spleen, the thin extremity not containing any.

Liver.—Normal in colour, showed under the capsule and evenly distributed throughout the substance moderately numerous minute translucent grey foci; on the convex surface there was a grey tubercle the size of a millet seed with a yellow centre.

Portal Glands.—Not apparently enlarged, showed on section scattered irregular yellow caseous foci and streaks, some of which were just perceptibly gritty; the caseous substance could be readily shelled out.

The Left Kidney.—Showed on the surface four minute greyish white points; none seen on section.

The Right Kidney.—Showed in the cortex a millet seed-sized tubercle with a caseous centre and grey margin and one minute grey focus.

Suprarenal Bodies.—Normal.

Tongue, Tonsils, Pharynx, Larynx and Trachea.—Normal.

Submaxillary and Cervical Glands.—Normal.

Two glands near the angle of the jaw on the left side contained each a minute caseous focus.

A gland near the right angle of the jaw contained one minute yellow point.

The Retro-pharyngeal Glands, the Left Prepectoral and Right Prescapular Glands.—Were normal.

The Left Prescapular Gland.—Contained a pinhead-sized caseous slightly gritty tubercle.

The Right Prepectoral Gland.—Contained a small grey tubercle with a calcareous grain in the centre.

Stomach and Intestines.—Normal.

Mesenteric Glands.—The glands in the anterior part of the mesentery were slightly enlarged and indurated and showed on section grey translucent tissue containing a coarse network of caseation. The rest of the mesenteric glands were normal with the exception of two or three which contained irregular caseous foci.

Ileo-Colic and Colic Glands.—Normal.

Several small glands around the head of the pancreas were irregularly caseated.

Cœliac Glands.—Not apparently enlarged; one showed on section some coarse yellow streaks of caseation, slightly gritty; another contained three or four pinhead-sized yellow caseous tubercles.

Thyroid Body.—Normal.

PIG 158.

Subcutaneous inoculation of culture derived from the original material of Virus B XXVIII.

Dose—1·0 milligramme.

Date—June 1st, 1906.

Initial Weight—35 lbs. Final Weight 32 lbs.

Died—July 19th, 1906. 48 days after inoculation.

POST-MORTEM EXAMINATION.

Body.—Slightly emaciated.

Local Lesion.—In the subcutaneous tissues of the abdominal wall on the right side, there was a tumour, about the size of a broad bean, composed of tough, yellowish-white caseated tissue with a small cavity in the centre filled with soft caseous material; the skin was adherent over the centre of the tumour and on the point of breaking down.

Superficial Inguinal Glands.—On the right side the one nearest the local lesion measured 1¼ in. by ¾ in. by ½ in., and, with the exception of a few small islets of fibroid tissue, was composed throughout of dense yellowish-white (waxy-looking) tissue showing opaque, white, gritty streaks. Two smaller glands were similarly but not so extensively caseous. The remaining glands were only slightly enlarged and showed very early foci of necrosis.

The glands on the left side contained two small caseating nodules.

Precrural Gland.—The right precrural gland showed in the cortex three congested yellowish caseating nodules, the largest 2 mm. in diameter.

In the left precrural gland there were two greyish-yellow nodules, the largest the size of a hemp seed.

Iliac Glands.—The right iliac gland was enlarged and congested, but no foci of necrosis were seen.

In the left iliac gland there was a yellowish tubercle about 1 mm. in diameter.

Lumbar Glands.—Not apparently enlarged; contained each an irregular caseating nodule, the size of a hemp-seed.

Thorax:

The Lungs.—Were closely beset with grey nodules evenly distributed throughout the substance; the nodules varied in size from a pin's head to that of a hemp seed, and remained discrete except in one or two places; on section the nodules had opaque yellowish centres and some were distinctly gritty; the subpleural nodules projected slightly from the surface, and a few were slightly "mushroomed."

The pleura on the dorsal surface of the caudal lobes showed numerous long delicate strands of connective tissue.

Around the margin of each caudal lobe in the slightly hypertrophied lymphatic fringes there was an almost continuous row of small grey tubercles.

The Bronchial Glands.—Were enlarged, congested and irregularly caseated.

Ventral Mediastinal Glands.—Two on the right side, the largest the size of a Barcelona nut, were dense and caseous practically throughout. The glands on the opposite side contained one or two small caseous tubercles.

The Dorsal Mediastinal Glands.—Appeared normal.

Pleura.—The pleura along the margins of some of the ribs and around the tendon of the diaphragm showed some small grey tubercles occurring mainly in small clusters.

Heart and Pericardium.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Spleen.—Not enlarged, contained in the pulp numerous firm nodules, the largest the size of a hemp seed; the nodules were yellow and necrotic with reddish margins or greyish red with yellow points in the centre.

The Liver.—Showed on the surface under the capsule rather sparsely scattered grey tubercles ranging in size from a point just visible to the naked eye up to that of a millet seed; the larger ones had minute opaque centres; on section similar tubercles were very sparsely scattered throughout the substance.

The Portal Glands.—Were slightly enlarged and contained discrete irregular greyish white tubercles, up to 1·5 mm. in diameter; most of the tubercles showed a minute opaque yellow point in the centre.

The Cœliac Glands.—Were slightly enlarged and contained similar tubercles.

The Kidneys.—Were rather pale; in the cortex of the right there was a pinhead-sized grey tubercle with a minute opaque centre; the left kidney was normal.

Suprarenal Bodies.—Normal.

Each Tonsil showed an ulcer, about 5 mm. in diameter, with an irregular floor covered with soft yellow necrotic material.

Tongue, Pharynx, Larynx and Trachea.—Normal.

Intestines.—Showed no sign of tuberculosis.

The Submaxillary Glands.—Contained numerous irregular yellow foci, up to 1·5 mm. in diameter.

Pharyngeal Glands.—The right retropharyngeal gland, slightly enlarged, contained a number of yellowish nodules, the largest the size of a hemp seed, some with opaque yellow points in the centre.

In the left retropharyngeal gland there were a few early tubercles.

The Cervical Glands.—On each side contained each a few caseating nodules, the largest the size of a hemp-seed.

The Left Prescapular Gland.—Contained a firm caseating nodule the size of a hemp seed.

The Right Prescapular Gland.—Appeared normal.

The Mesenteric Glands.—Were not enlarged; they contained a few irregular yellow caseous tubercles, the largest a little larger than a millet seed.

There were similar tubercles in the ileo-colic glands.

Microscopical Examination (Smear Preparations).

Tonsil (ulcer) }
Left Iliac Gland } A few tubercle bacilli.

PIG 160.

Subcutaneous inoculation of culture derived from the original material of Virus B XXVIII

Dose—0·1 milligramme.

Date—June 1st, 1906.

Initial Weight—31 lbs. Final weight, 49 lbs.

Killed—August 23rd, 1906. 83 days after inoculation.

POST-MORTEM EXAMINATION.

Condition.—Poorly developed.

Local Lesion.—In the subcutaneous tissues on the right side of the abdomen there was a nodule the size of a French bean composed of tough yellow caseous substance showing one or two foci of softening. The abdominal muscles beneath this nodule contained several firm yellow gritty caseous nodules the largest the size of a French bean.

Between the local tumour and the inguinal glands there was a chain of gritty caseous nodules, with fibrous capsules, the largest the size of a hemp seed; no thickened lymphatic vessels were seen.

Superficial Inguinal Glands.—On the right side the one nearest the local lesion was much enlarged, measuring 1¼ in. by 1¼ in. by ½ in., and showed on section dense gritty caseous masses replacing about three-quarters of its substance; another gland, the size of a bean, contained a pea-sized caseous nodule; a small pea-sized gland was closely beset with yellow caseous tubercles; other glands were normal.

On the left side a pea-sized gland was almost completely caseous; all the others were normal.

The Right Precrural Gland.—Showed in the cortex two yellow gritty caseous tubercles, the largest 2 mm. in diameter.

The Left Precrural Gland.—Was normal.

Iliac Glands.—The right iliac gland was slightly enlarged and closely beset with firm discrete gritty caseous tubercles, with grey translucent margins, the largest 2 mm. in diameter.

The Left Iliac Gland.—Was normal.

One Sacro-iliac Gland.—Contained a millet seed sized tubercle slightly opaque in the centre.

Lumbar Glands.—On the right side one contained a yellow caseous tubercle the size of a millet seed.

Thorax :

Lungs.—The lungs were crepitant and collapsed normally; they contained moderately numerous evenly distributed hard nodules ranging in size from a pin's head up to that of a hempseed. On section the nodules had soft yellow caseous centres and grey translucent margins.

The Bronchial Glands.—On both sides were much enlarged and indurated; on section they showed firm yellow gritty caseous areas, mostly small, embedded in dense fibroid glandular tissue.

Mediastinal Glands.—A dorsal mediastinal gland contained a yellow caseous nodule the size of a hemp seed.

A ventral mediastinal gland on the right side the size of a marble was composed throughout of dense yellow gritty caseous substance; the capsule was slightly thickened. The glands on the left side were normal.

Pleura.—On the costal pleura there were two hard lenticular nodules, with yellow centres, the largest the size of a hempseed.

Diaphragm.—Normal.

Larynx and Trachea.—Normal.

Heart.—Normal.

Abdomen :

The Omentum.—Near the spleen showed three small nodules with caseous centres and fibrous margins.

Peritoneum.—Between the coils of the large intestine there were about half a dozen similar nodules the largest the size of a hempseed. On the serous surface of the stomach at the cardiac end there were two lenticular caseating nodules and there was a small nodule on the left epididymis.

Spleen.—Not enlarged, contained numerous spherical nodules ranging from 5 to 3 mm. in diameter; they had friable yellow caseous centres and translucent grey margins.

The Liver.—Contained moderately numerous nodules similar to those in the spleen ranging in size from a millet seed, or less, up to that of a hempseed.

The Portal Glands.—Were enlarged and indurated and showed their substance extensively replaced by firm yellow gritty caseous areas of various sizes the larger areas were very irregular in outline.

The Coeliac Glands.—Were enlarged and similarly affected.

Kidneys.—The right kidney showed in the depth of the cortex a grey translucent nodule the size of a barley grain. The left kidney was normal.

Suprarenal Bodies.—Normal.

Tongue, Tonsils and Pharynx.—Normal.

Stomach.—Normal.

Intestines.—The small intestines contained numerous round worms. There was no sign of tuberculosis.

Submaxillary Glands.—The left submaxillary gland, the size of a pigeon's egg, was indurated and closely beset with caseous nodules, in places confluent. The right submaxillary gland resembled the left.

Left Pharyngeal Gland.—Contained three irregular yellow caseous nodules, the largest the size of a hempseed. The gland on the right side was normal.

Left Prescapular Gland.—Showed at one extremity a group of yellow caseous nodules.

Right Prescapular.—Contained a pinhead-sized caseous tubercle.

Cervical Glands.—Normal.

Mesenteric Glands.—Most of the mesenteric glands contained yellow caseous areas, the largest 6 to 7 mm. in diameter; the glands at the anterior end were most affected.

The Ileo-colic and some of the Colic Glands.—Contained similar areas.

Testicles.—Normal.

VIRUS B XXIX.

February 12, 1906.

MEDIASTINAL GLAND.

Bronchial and mediastinal glands from a young cow in good condition.

Two of the mediastinal glands were slightly enlarged and composed throughout of a brownish translucent tissue, containing a yellow necrotic network; in the middle of one of these glands there was a calcareous mass, the size of a split pea, which easily shelled out.

The bronchial glands were normal and there was no sign of tubercle elsewhere in the body.

VIRUS B XXIX.

(February 12, 1906.)

MEDIASTINAL GLAND.

RABBITS.

Inoculated on June 21, 1906, with culture derived from the original material.

The culture used was the 7th generation ; 20 days old.

The total age of culture was 129 days.

Number of Rabbit.	Dose.	Method of Inoculation.	Duration of Life.	Result.
905 - - - -	1·0 mg.	Intravenous	D. 11 days	G.T.
906 - - - -	0·1 mg.	Intravenous	D. 12 „	G.T.
908 - - - -	1·0 mg.	Intraperitoneal	D. 50 „	G.T.
907 - - - -	0·1 mg.	Intraperitoneal	D. 23 „	G.T.
909 - - - -	1·0 mg.	Subcutaneous	D. 81 „	G.T.

No Calves were inoculated with this virus.

VIRUS B XXX.

March 30, 1906.

BRONCHIAL GLAND.

The specimens, pieces of omentum and lung, some mesenteric glands, an inguinal and a bronchial gland, were taken from a calf, four months old, which was killed on March 29. 1906. On the omentum there were numerous firm nodules, mostly about the size of peas, composed of firm translucent tissue, containing a yellow caseous network, gritty from calcification. One of the mesenteric glands was irregularly caseated and gritty from calcification.

The inguinal gland was enlarged, and on section showed part of its substance irregularly caseous and gritty, while the rest was studded with yellow foci, mostly gritty.

The piece of lung contained scattered nodules up to 4 or 5 mm. in diameter with yellow calcareous centres.

The bronchial gland, not much enlarged, showed a calcareous patch and irregular caseo-necrotic foci, some gritty, forming in places a network.

The post-mortem examination also showed tuberculosis of the pleura, liver, spleen and penis.

CULTURE INOCULATIONS.

VIRUS B XXX.

(March 30, 1906.)

BRONCHIAL GLAND.

RABBITS.

Inoculated on June 21, 1906, with culture derived from the original material.

The culture used was the 4th generation ; 20 days old.

The total age of culture was 83 days.

Number of Rabbit.	Date.	Method of Inoculation.	Duration of Life.	Result.
914 - - - -	1·0 mg.	Intravenous	D. 12 days	G.T.
915 - - - -	0·1 mg.	Intravenous	D. 15 „	G.T.
916 - - - -	1·0 mg.	Intraperitoneal	K. 68 „	G.T.*
917 - - - -	0·1 mg.	Intraperitoneal	D. 6 „	Coccidiosis of Liver.
918 - - - -	1·0 mg.	Subcutaneous	D. 126 „	G.T.
919 - - - -	0·1 mg.	Subcutaneous	K. 109 „ (Dying)	G.T.

No Calves were inoculated with this virus.

* The inoculation in this animal was partly subcutaneous and partly intracæcal.

INOCULATION EXPERIMENTS ON DOGS.

INOCULATION EXPERIMENTS ON DOGS.

With Tuberculous Tissues.

Two dogs were inoculated, one subcutaneously the other intraperitoneally, with an emulsion made from the tuberculous organs of guinea-pigs (Virus B. IV.), each animal receiving about 10·15 million tubercle bacilli.

The dog inoculated intraperitoneally developed acute general tuberculosis and was killed in a dying condition in 71 days.

The dog inoculated subcutaneously lived 171 days and was killed in good health; during the experiment there were no constitutional symptoms, and the local lesion which formed first ulcerated and then disappeared.

On post-mortem examination a few pearly tubercles were found in the omentum and there were some doubtful foci in the lungs and kidneys. (No tubercle bacilli.)

With Culture.

Two puppies were inoculated, one subcutaneously the other intraperitoneally, each with 1 milligramme of culture from Virus B. IX.

The intraperitoneal animal died in 32 days and showed tuberculous peritonitis, early necrosis of the sternal and coeliac glands, a grey focus in each kidney, and several patches of broncho-pneumonia, but no tubercles in the lung.

The subcutaneous animal was killed 98 days after inoculation and showed a local lesion, tuberculosis of the nearest glands and scattered tubercles in the lungs and liver.

Two young adult dogs were inoculated, one subcutaneously the other intraperitoneally, each with one milligramme of culture from Virus B. XXII.

The dog inoculated intraperitoneally was ill for several weeks and then recovered. On post-mortem examination there was no disease of the omentum or peritoneum; the lungs showed some doubtful foci and two or three grey nodules in which tubercle bacilli were found; the kidneys contained numerous tubercles of a doubtful nature; a coeliac gland showed two whitish tubercles (no tubercle bacilli), and there were a few yellow points in the liver.

The subcutaneous animal showed after 155 days nothing more than a cicatrix at the site of inoculation on the left side of the abdomen, and a cicatrix over the left inguinal gland; all the organs and glands were perfectly normal to the naked eye; a guinea-pig inoculated with an emulsion from the left inguinal gland remained healthy.

An adult dog was inoculated subcutaneously with 10 milligrammes of culture derived from Dog 56, Virus B. IV. (*See* Modification Experiments, Vol. III.), and killed 76 days afterwards; at the seat of inoculation there was a small cavity with a sinus leading from it, a large tuberculous cavity in the region of one axilla, and miliary tubercles, of the grey fibrous variety, in the lungs.

Two other dogs, one a puppy, the other an adult retriever, were inoculated subcutaneously, each with 25 milligrammes of culture from Virus B. XXIV., and killed in 92 and 93 days respectively.

In the adult animal there was a small cavity at the site of inoculation, lined with granulation tissue, with two sinuses leading from it; the lungs contained a few minute grey tubercles and there were a few doubtful foci in the liver and kidneys.

The young animal also showed a tuberculous cavity at the site of inoculation, with several openings from it through the skin; the adjacent gland was tuberculous, and there was a sinus leading from it through the skin; there were about ten nodules in the lungs and numerous minute tubercles in the liver.

General Results.

The experiments show that the dog is very resistant to subcutaneous inoculation of bovine tubercle bacilli, but may develop general tuberculosis when the material is inoculated intraperitoneally.

The local effects in the dog after subcutaneous inoculation are very characteristic.

A swelling soon appears, and this very quickly ulcerates; the ulcer (sometimes there are several which subsequently unite) enlarges for a time and has abrupt margins and floor covered with bright red granulations.

The ulcer then begins to contract; the skin gradually grows over from the margins, and a space, lined with granulation tissue, is formed which communicates externally through one or more fistulous openings; the cavity then gradually shrinks and may finally, as occurred in two cases, be completely obliterated, leaving nothing more than a scar at the site of inoculation.

The glands nearest the local lesion enlarge and there is usually much periglandular infiltration; the skin becomes adherent and then ulcerates and sinuses may be formed which extend into the tissues around the gland or into the substance of the gland.

If the dog be allowed to live the glands diminish in size, the ulcers or sinuses close up, and usually all that remains to indicate that there has been a morbid process in the region is a small white scar.

In two of the six animals inoculated subcutaneously there were no lesions at the site of inoculation, no disease of the nearest glands, and no naked eye evidence of tuberculosis in the internal organs.

In the other four cases grey miliary tubercles were found in the lungs and in two, minute tubercles in the liver.

In several cases, it will be noticed, small whitish tubercles have been found in the kidneys; these were not apparently of a tuberculous nature.

DOG 24.

Subcutaneous.—Inoculation of 0·5 cc. of an emulsion made from the tuberculous organs of Guinea-Pigs 1,148, and 1,150 (Milk of Cow 164 ; Virus B. IV.).

Dose of Tubercle Bacilli.—10,150,000.

Date of Inoculation.—August 24th, 1905.

Tuberculin Test.—December 16th, 1904. Positive. Rise of Temperature, 1·2° C.

Clinical History.—A tumour formed which softened, ulcerated, and then disappeared. There were no constitutional symptoms.

Killed.—In good health, February 11th, 1905, 171 days after inoculation.

Post-Mortem Examination.

There was no local lesion.

Inguinal and Axillary Glands.—Normal.

Omentum.—The omentum showed a number of discrete pearly tubercles, the size of pins' heads.

Spleen.—Three Malphigian bodies seemed rather larger than usual ; they were grey, homogeneous, and without necrosis.

Liver.—On the surface under the capsule there was one grey speck ; nothing abnormal was seen on section.

Portal Gland.—Normal.

The Left Kidney.—Showed on the surface two or three grey translucent foci and a minute spherical grey body which easily shelled out (No T. B.).

The Right Kidney.—Showed a homogeneous grey tubercle the size of a millet seed and one or two grey spots similar to those in the left kidney.

Suprarenal Bodies.—Normal.

Lungs.—Pigmented, crepitant throughout ; they showed on the surface under the pleura numerous slightly raised greenish-grey homogeneous bodies, a little larger than a millet seed ; there were also a few nodules, varying from 1 to 2 mm. in diameter ; these were firmer and greyer than the above, and were found chiefly along the margin of the caudal lobes ; some of the larger ones contained a small central cavity, in which there was greyish broken-down material. None of the above structures had the appearance of ordinary tubercles.

Bronchial Gland.—Normal.

Cervical, Pharyngeal and Submaxillary Glands.—Normal.

Microscopical Examination. (*Smear preparations*).

Lung Nodule (material from centre of one of large nodules). No tubercle bacilli.

Spleen: }
Kidney: } No tubercle bacilli.

Paraffin sections of the liver, kidney and lung showed nothing of a tuberculous nature.

DOG 26.

Intraperitoneal.—Inoculation of an emulsion made from the tuberculous organs of Guinea-Pigs 1,148 and 1,150 (Milk of Cow 164; Virus B. IV.).

Amount of Emulsion.—0·5 cubic centimetre.

Number of Tubercle Bacilli.—10,150,000.

Date of Inoculation.—August 24th, 1904.

Clinical History.—The dog gradually became very weak and emaciated, and was killed on November 3rd, 1904, a dying condition.

Duration of Experiment.—71 days.

Post-Mortem Examination.

Body.—Very emaciated.

Testicle.—The epididymis of the right testicle was enlarged and indurated, and showed on section firm translucent tissue, penetrated with an opaque yellow network; the skin adhered to the mass, and was ulcerated around the root of the scrotum.

The peritoneal cavity contained a large excess of serous fluid.

Omentum.—The omentum was slightly retracted, and contained numerous nodules disposed singly and in groups or in continuous lines running along the blood vessels. The single nodules ranged in size up to that of a pea, and had yellow, but not softened, centres and translucent margins; the nodules in the groups had a similar appearance.

In the omentum near the pylorus there was an irregular hard mass about the size of a walnut, which on section showed dense translucent caseating tissue.

The parietal peritoneum showed no tubercles.

In the anterior part of the mesentery there were two or three groups of discrete tubercles, opaque in the centre.

The mesocolon showed a few similar scattered tubercles.

Mesenteric Glands.—The mesenteric glands were not obviously enlarged; they showed in the cortices irregular yellow patches surrounded by firm translucent tissue.

Spleen.—The spleen was not apparently enlarged; the tissue was firm and of a normal colour; on section there was no macroscopic evidence of tubercle.

Kidneys.—The kidneys, on stripping off the capsules, showed a peculiar marbled or convoluted appearance, olive green, slightly depressed areas, irregular in outline, alternating with areas of a rosy or pinkish grey colour; the cortices contained greyish white foci, the size of a pin's head and less; one or two were slightly opaque in the centre, but the majority were homogeneous throughout; they were more numerous in the left than the right kidney.

Liver.—The liver was greatly enlarged, and packed as closely as possible with soft whitish foci, irregular in outline, and about 1 mm. in diameter; the substance of the liver was intensely icteric.

In the small omentum there were two enlarged oedematous glands, which on section showed in the cortices numerous yellow foci studding a pale translucent tissue; at one part each gland showed a small irregular cavity, filled with thin greenish-yellow ill-formed pus; the cavities were crossed by slender fibrous trabeculae.

Coeliac Glands.—One coeliac gland was as large as a pigeon's egg, and on section resembled the glands in the small omentum.

Lumbar Glands.—Were slightly enlarged and tuberculous, but were not in so advanced a state of caseation as the coeliac.

Iliac Glands.—Were enlarged and oedematous, and showed groups of yellow foci in the cortices.

Thorax.—The pleural cavities contained a small quantity of serous fluid.

Pleura.—On the surface of the parietal pleura there were some minute transparent barely visible granules; similar foci were seen on the peritoneal surface of the diaphragm.

Lungs.—Both lungs were closely beset with grey miliary tubercles, some about 1 mm. others 2 mm. in diameter; the larger ones being slightly opaque in the centre.

Bronchial Glands.—Were not enlarged nor obviously tuberculous.

Mediastinal Glands.—One ventral mediastinal gland (sternal) was about as large as the coeliac, and was composed of firm translucent tissue, penetrated with a yellow network.

Near the latter was a small pea-sized gland, firm and tuberculous throughout.

Heart.—Normal.

Cervical Glands.—Normal.

Microscopical Examination. (*Smear preparations.*)

Peritoneal Fluid.—No tubercle bacilli. Fluid contained leucocytes and epithelial cells.

Omentum.—Numerous short slender tubercle bacilli.

Cœliac Gland.—Tubercle bacilli very numerous, in clumps and singly; many in cells.

Ventral Mediastinal Gland.—Tubercle bacilli very numerous, some very long and curved, others beaded.

Bronchial Gland.—Three tubercle bacilli.

Mesenteric Gland.—Tubercle bacilli present but not numerous.

Liver.—Numerous tubercle bacilli; many in clumps.

Spleen.—Tubercle bacilli found in small groups.

Kidney.—No tubercle bacilli.

DOG 70.

Subcutaneous.—Inoculation of culture obtained from the original material of Virus B XXII. (through Guinea-Pig 1,509).

Dose.—1·0 milligramme.

Date.—September 4th, 1905.

Tuberculin Test.—February 2nd, 1906. Positive. Rise of temperature, 1·2° C.

Clinical History.—There was no sign of illness throughout the experiment. A small swelling developed at the seat of inoculation, and on October 13th showed a red granulating ulcer, the size of a threepenny-piece, discharging serum. The swelling diminished in size, the ulcer healed, and for several weeks before the death of the animal nothing could be felt at the seat of inoculation. Five weeks after inoculation the right inguinal glands were much enlarged: the skin over the glands became adherent, reddened, and showed a tendency to break down; it eventually did break down, and there was some discharge for several weeks. On November 20th the skin was quite healed and the glands were very little if at all enlarged.

Killed.—February 6th, 1906. [155 days after inoculation.]

Post-Mortem Examination.

At the seat of inoculation, a little to the right of the umbilicus, there was a small white scar; on section nothing abnormal was seen in the subcutaneous tissues.

The skin over the right inguinal glands showed a similar scar; the inguinal glands were normal in size and appearance.

Omentum and Peritoneum.—Normal.

Spleen, Liver, Portal Gland.—Normal.

Kidneys.—Capsules stripped badly; there were a few small cysts in the cortex; otherwise normal.

Suprarenal Bodies.—Normal.

Mesenteric and Coeliac Glands.—Normal.

Lungs, Bronchial Glands, Sternal Glands.—Normal.

A guinea-pig inoculated intraperitoneally with an emulsion made from the right inguinal glands was killed after 23 days and found to be free from any sign of tuberculosis.

DOG 72.

Intraperitoneal.—Inoculation of culture from Virus B XXII. (through Guinea-pig 1,509).

Dose.—1·0 milligramme.

Date of Inoculation.—September 4th, 1906.

Tuberculin Test.—February 2nd, 1905. Positive. Rise of temperature, 1·2° C. Maximum 39·7° C. at sixth hour.

Clinical History.—At the end of six weeks the animal had become very thin; for several weeks she was thin and wasted and had a poor appetite; then there was an improvement in her condition, and when killed her general appearance was good and she seemed to be putting on flesh.

Killed.—February 7th, 1906. 156 days after inoculation.

Post-Mortem Examination.

Condition.—Moderately good.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Showed on the surface under the capsule about half-a-dozen yellow foci and a few scattered yellow foci on section.

Portal Gland.—Normal.

The *Coeliac Gland.*—Showed in the cortex two whitish tubercles, the largest the size of a millet-seed.

Kidneys.—In the cortex of each there were numerous tubercles, ranging in size from about 0·5 to a little over 1 mm. in diameter; most of the tubercles had grey margins and opaque yellowish centres, some softened, a few had a yellowish translucent appearance throughout. Medullary zones normal.

Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lungs were crepitant and collapsed normally; they showed on the surface a moderate number of yellowish (some greenish-yellow) slightly raised bodies, the largest the size of a hemp seed; they could be felt between the finger and thumb; when cut into they had no definite outline, and appeared to be composed mainly of fibrous tissue; near the margins of the caudal lobes there were two or three firm translucent grey nodules, in one of which tubercle bacilli were found.

Thoracic Lymphatic Glands.—Normal.

Intestines.—Normal.

Submaxillary Glands.—Normal.

Cervical Glands.—Normal.

Inguinal Glands.—Normal.

Mesenteric Glands.—Normal.

Microscopical Examination (*Smear Preparations*).

Lung (Grey nodule).—4 tubercle bacilli.

Lung (Yellow tubercle).—No tubercle bacilli.

Kidney.—No tubercle bacilli.

Liver.—No tubercle bacilli.

Coeliac gland.—No tubercle bacilli.

A guinea-pig inoculated intraperitoneally with an emulsion made from the lung was killed (with tuberculin) after 41 days and showed general tuberculosis.

DOG 114. (Puppy.)

Intraperitoneal—Inoculation of culture derived from the original material of Virus B IX. through Guinea-pig 1069.

Dose—1·0 milligramme.

Date—March 29th, 1906.

Died—April 30th, 1906. 32 days after inoculation.

POST-MORTEM EXAMINATION.

Body.—Thin.

Abdomen :

The Omentum was not retracted; it contained fairly numerous tubercles ranging in size from a mere point to a little less than a hemp-seed; the smaller tubercles were transparent or translucent, the larger ones light grey and opalescent. In several places the tubercles were aggregated together into small irregular firm masses, which on section showed firm, grey, translucent tissue, containing indefinite streaks and foci ? of beginning necrosis.

The Parietal Peritoneum, particularly in the lumbar regions, in the right flank and on the diaphragm, was closely covered with flat, translucent tubercles, up to about 1 mm. in diameter; the tubercles were not perceptible to the touch.

The Serous surface of the stomach where uncovered by liver showed an eruption of transparent granules. The serous surfaces of the small intestine had a glistening appearance, not quite natural, but no definite tubercles were seen except for a short distance along the duodenum.

The Mesentery was covered with minute translucent foci, not perceptible to the touch; the foci were most numerous on the anterior portions of the mesentery, where there were also several discrete nodules and small groups of nodules similar to those in the omentum. The meso-colon showed a similar appearance.

A gland near the pylorus showed in the cortex one or two small yellow foci.

The Mesenteric Glands were normal in size and general appearance; there was a doubtful opaque point in one.

The Spleen was pale and not enlarged; there were numerous transparent granules on the surface. On section a few small hæmorrhages were seen, but no tubercles.

The Liver showed fairly numerous, minute, greyish-white foci, principally on the convex surface: on section the substance appeared normal.

The Portal Gland was normal.

Kidneys.—In the cortex of the left kidney, there was a minute spherical grey tubercle; there was a similar but slightly larger tubercle in the right kidney.

Suprarenal Bodies.—Normal.

A Coeliac Gland showed in the cortex two or three small, indefinite yellowish patches.

Lumbar, Iliac, and Ilio-Sacral Glands.—Normal.

Thorax :

Lungs.—On the dorsal surface of the right caudal lobe there was a patch of congestion; the lung tissue at this point was firmer than normal, but was still air-containing.

In the left lobes, chiefly on the dorsal surfaces, were several greyish red patches of consolidation; these on section and pressure exuded semi-purulent fluid from the bronchioles; no tubercles were found in any part of the lung.

The Bronchial Glands were normal.

The Sternal Glands were slightly enlarged, and showed on section small irregular yellow patches of necrosis.

Submaxillary, Pharyngeal, and Cervical Glands.—Normal.

Microscopical Examination (*Smear preparations*).

Bronchial Gland }
Spleen Pulp - } No tubercle bacilli.

Pneumonic Patch.—One tubercle bacillus.

Sternal Gland.—Swarms of tubercle bacilli.

DOG 112. (Puppy.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B IX., through Guinea-pig 1069.

Dose—1·0 milligramme.

Date—March 29th, 1906.

Killed—In good health, July 5th, 1906. [98 days after inoculation.]

Clinical History.

The dog was inoculated subcutaneously in the wall of the abdomen.

A fortnight later there was a thickening at the site of inoculation, the skin over which showed two small ulcers each about 8 mm. in diameter; these slowly extended and then united, forming a large ulcer with granular floor; this then gradually contracted and finally became represented by a very small opening.

The inguinal glands enlarged, the skin over them became adherent and then ulcerated in several places.

Tuberculin Test.

May 10th, 1906, 42 days after inoculation. 5·0 cc. tuberculin inoculated. Rise of temperature, 1·0° C.

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the mid-line of the abdomen there was a small thickened patch, the skin over which showed a slightly depressed linear cicatrix, at one extremity of which there was a small opening discharging pus; on section the opening was found to lead into a small space with fibrous walls lined internally with vascular organising granulation tissue.

Inguinal Glands.—In each inguinal region there was a small swelling, the skin over which was adherent and showed the openings of several short sinuses situated in the centre of small irregular scars.

On section the glands were enlarged, fibroid, and showed here and there in the cortex indefinite yellow streaks of necrosis. The tissues around the glands were much thickened and showed several small spaces, lined with granulation tissue, communicating externally through the above-mentioned openings.

The right iliac gland appeared a little enlarged and showed at one extremity a small irregular yellowish patch of necrosis. The left iliac gland was normal.

Thorax.

Lungs.—The lungs were normal in general appearance and were crepitant throughout; they showed under the pleura sparsely scattered grey tubercles, with no sign of central caseation, the largest the size of a millet-seed; in one caudal lobe there was a grey nodule the size of a hemp-seed. In the thin margin of one of the caudal lobes there was a small grey translucent patch, irregular in outline (no tubercle bacilli were found in a smear made from this).

The Bronchial Glands.—Were normal.

Heart and Pleura.—Normal.

Abdomen.

The Spleen.—Was not enlarged; around the margin at one extremity there were a few minute transparent granules; on section the pulp was normal.

The Liver.—Was normal in general appearance and showed, sparsely scattered throughout the substance, pin-head sized grey tubercles with opaque whitish centres.

Portal, Cœliac, Mesenteric, Ileo-Colic, and Colic Glands.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Tonsils, Pharynx, Submaxillary, Pharyngeal, Cervical, and Axillary Glands.—Normal.

Microscopical Examination. (*Smear preparations.*)

Inguinal Gland.—Tubercle bacilli singly and in small clumps; the latter appeared very degenerate.

Liver - - *Lung* - - *Spleen* - -	No tubercle bacilli.

DOG 120. (Puppy.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B XXIV.

Date—April 10th, 1906.

Dose—25 milligrammes.

Weight at Death—5,280 grammes.

Killed—July 11th, 1906. [92 days after inoculation.]

Clinical History.

The dog was inoculated subcutaneously between the shoulders.

A thickening developed which extended downwards over the left shoulder; the skin ulcerated at the inferior extremity of this thickening as well as in several other places, and there was a constant discharge of pus from all the openings. The left prescapular gland became enlarged, the skin adhered to it, and towards the end of the experiment broke down. The general health of the animal was unaffected by the inoculation.

Tuberculin Test.

May 10th, 1906. 30 days after inoculation. Dose of tuberculin, 5·0 cc. The temperature rose from 38·4° C. just before inoculation to 39·5° C. 9 hours afterwards; the highest temperature during the preceding 4 days was 39·5° C.

POST-MORTEM EXAMINATION.

Condition.—Moderately good.

Local Lesion.—Over the upper part of the left scapula there was an opening about half an inch in diameter, the skin around which was thickened, inverted and puckered. The opening led into an irregular flat space in the subcutaneous tissues, 3 in. in length, and 1½ in. in greatest breadth, lined with soft pinkish granulation tissue discharging pus. The skin over the inferior extremity of the space showed a series of three or four small openings through which thin pus could be expressed.

The Left Prescapular Gland.—Was enlarged, measuring 1½ in. in length, and closely adherent to the surrounding structures. On section the upper part of the gland was composed of dense fibroid tissue containing dull white soft shreddy streaks; the rest of the gland was soft, reddish, and resembled granulation tissue. (A smear made from this part of the gland showed a few tubercle bacilli and numerous organisms stained blue, chiefly short chains of cocci.) The skin over the upper part of the gland showed the orifice of a sinus discharging semi-purulent material; the sinus extended into the gland substance and was lined with reddish granulation tissue.

Thorax.

The Lungs.—Were crepitant throughout. In the left caudal lobe just under the pleura there were two firm grey nodules the size of hemp seeds, and one in the depth the size of a millet seed with a caseous centre; in the right caudal lobe there was one hemp-seed sized nodule caseous in the centre and one miliary caseous tubercle. In the cephalic lobes there were about half a dozen shotty tubercles, caseous in the centre, the largest the size of a millet seed.

The Bronchial Glands.—Seemed rather larger than usual, but were not obviously abnormal on section.

Heart and Pleura.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Contained very numerous evenly distributed grey tubercles, with whitish centres, the largest not more than 0·5 mm. in diameter.

Portal Gland.—Normal.

Kidneys.—The capsules stripped badly; no tubercles were seen.

Suprarenal Bodies.—Normal.

Pharynx and Intestines.—Normal.

Submaxillary, Pharyngeal, Cervical, Right Prescapular, and Inguinal Glands.—Normal.

Microscopical Examination. (*Smear preparations.*)

Left Prescapular Gland.—A few tubercle bacilli; numerous other organisms.

DOG 118. (Adult Retriever.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B XXIV.

Date—April 10th, 1906.

Dose—25 milligrammes.

Killed—July 12th, 1906. [93 days after inoculation.]

Clinical History.

The dog was inoculated subcutaneously in front of the left shoulder.

A large swelling developed which ulcerated and then diminished in size; there was a constant discharge of pus from the ulcer, at first very profuse.

POST-MORTEM EXAMINATION.

Condition.—Good.

Local Lesion.—On the left side of the neck just in front of the shoulder there was a narrow ulcer 1 in. in length, at the upper extremity of which there was an opening the diameter of a crow-quill which communicated with a small space in the subcutaneous tissues between the ulcer and the spinous processes of the vertebræ. The space was lined with soft reddish granulation tissue and surrounded by fibrous tissue.

On the right side of the neck just in front of the right shoulder there was a minute opening, surrounded by soft pink granulations, situated in the centre of a small scar. This opening was the external orifice of a long narrow; suppurating track, lined with soft reddish granulation tissue which communicated with the space above described; the walls of the track were thickened with fibrous tissue. The prescapular glands on both sides were normal in size and appearance.

Thorax.

Lungs.—The lungs showed just under the pleura two or three small hard grey transparent tubercles, the largest the size of a pin's head; three similar tubercles were seen in the depth of the lung.

Bronchial Glands.—Normal.

Heart and Pleura.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The pulp contained an irregular hard pigmented fibrous nodule, the size of a hemp seed, adherent to both layers of the capsule; otherwise the spleen was normal.

Liver.—In the substance under the capsule there were about half a dozen soft yellow foci the largest the size of a millet seed; there were also one or two grey foci; on section the liver appeared normal.

Portal Gland.—Normal.

Kidneys.—Each kidney showed in the cortex moderately numerous grey spherical tubercles, the largest 1 mm. in diameter; the majority of these had a minute opaque centre.

Suprarenal Bodies.—Normal.

Tonsils, Pharynx and Intestines.—Showed no sign of tuberculosis.

Submaxillary, Pharyngeal, Cervical, Mesenteric, Lumbar, Iliac and Inguinal Glands.—Normal.

Microscopical Examination. (*Smear preparations.*)

Kidney - - *Liver* - -	No tubercle bacilli.

A guinea-pig inoculated with an emulsion made from liver substance, containing two yellow foci remained healthy.

SUMMARY OF INOCULATION EXPERIMENTS ON DOGS WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

INOCULATIONS WITH TISSUE EMULSIONS.

Virus.	Number of Dog.	Age.	Material Inoculated and Dose.	Method of Inoculation.	Duration of Life.	Killed or Died.	Post-Mortem Results.
B IV.	24	Adult	0·5 cc. of an emulsion of Guinea-pig organs (Virus B IV.) containing 10·15 million tubercle bacilli.	Subcutaneous	171 days	Killed in good health	No definite tuberculous lesions.
B IV.	26	Adult		Intraperitoneal	71 days	Killed dying	Acute generalised tuberculosis; tuberculosis of omentum and mesentery and meso-colon (slight); lungs beset with miliary tubercles; liver greatly enlarged and packed with soft whitish tubercles; there were scattered tubercles in the kidneys; the sternal glands and most of the abdominal lymphatic glands were tuberculous; the epididymis of the right testicle was enlarged and caseating.

CULTURE INOCULATIONS.

Virus.	Number of Dog.	Age.	Dose.	Method of Inoculation.	Duration of Life.	Killed or Died.	Post-mortem Results.
B XXII.	70	Young adult	1·0 mg.	Subcutaneous	155 days	Killed in good health	No tuberculosis; there was a scar at the seat of inoculation, and a scar over the right inguinal glands.
B XXII.	72	Young adult	1·0 mg.	Intraperitoneal	156 days	Killed in good health	There were a few fibrous nodules in the lung; the kidneys contained numerous tubercles, not apparently tuberculous; the liver showed some yellow points. Tubercle bacilli found in a lung nodule; none elsewhere.
B IV.	74	Adult	10·0 mg.	Subcutaneous	63 days	Killed in good health	Local lesion; nearest glands not apparently tuberculous; in the left axilla there was a large cavity lined with granulation tissue, and in the left groin a small sinus extending to the inguinal gland; the lungs contained numerous grey miliary tubercles, and there were a few small tubercles in each kidney (? tuberculous).
B IX.	112	Young	1·0 mg.	Subcutaneous	98 days	Killed in good health	Small local thickening; inguinal glands enlarged and indurated, showed on section indefinite streaks of necrosis; peri-glandular tissues thickened; skin adherent, scarred, showed numerous small sinuses. Lungs contained sparsely scattered grey fibrous tubercles. The liver showed sparsely scattered throughout greyish-white pin-head sized tubercles.
B IX.	114	Young	1·0 mg.	Intraperitoneal	32 days	Died	Tuberculous peritonitis; sternal and cœliac glands showed early necrosis; in the lungs there were several patches of broncho-pneumonia but no tubercles; there was a grey tubercle in each of the kidneys.
B XXIV.	120	Young	25·0 mg.	Subcutaneous	92 days	Killed in good health	Ulcerated local lesion; adjacent prescapular gland enlarged, indurated and tuberculous. The lungs contained about ten nodules, the largest the size of a hemp seed. There were numerous minute tubercles in the liver. Other organs and glands were normal.
B XXIV.	118	Adult	25·0 mg.	Subcutaneous	93 days	Killed in good health	There was a small cavity at the site of inoculation, lined with granulation tissue, with two sinuses leading from it. The lungs contained a few minute grey tubercles, and there were a few doubtful foci in the liver and kidneys (no tubercle bacilli found).

INOCULATION EXPERIMENTS ON CATS.

INOCULATION EXPERIMENTS ON CATS.

Twelve cats have been inoculated, ten subcutaneously and two intraperitoneally, with culture from four of the bovine viruses, namely, Viruses B I., III., XVIII., and XXVIII.

Two cats inoculated subcutaneously with 1 mg. of culture from Virus B.I. were killed when very ill in 35 and 49 days respectively; in each case there was a local lesion and caseation of the nearest glands and severe tuberculosis of the lungs, the abdominal organs not being affected to any extent.

Another cat inoculated subcutaneously with 1 mg. of culture from Virus B XVIII. died in 70 days, apparently from impacted fæces; the post-mortem examination showed a local lesion, tuberculosis of the nearest glands, numerous tubercles in the kidneys and the thyroid, and a few nodules in the lungs.

A cat inoculated intraperitoneally with 1 mg. of culture from Virus B. III. died in 39 days and shewed tuberculous peritonitis, enlargement and caseation of the abdominal lymphatic glands and the ventral mediastinal glands, one caseous nodule in the liver and a few doubtful foci in the lungs.

Two kittens, each inoculated with 1 mg. of culture from Virus B. III., one subcutaneously, the other intraperitoneally, died in 17 days, before definite lesions had had time to form in the internal organs; tubercle bacilli were numerous in all the organs and were found in one case in the marrow.

Another kitten, inoculated subcutaneously with culture from Virus B. XVIII., died in 25 days; the carcass was partly eaten, but sufficient remained to show that in this case also death was due to acute tuberculosis, bacilli being very numerous in all the organs.

Two cats and three kittens were inoculated subcutaneously with culture derived from the original material of Virus B. XXVIII.

One of the cats, a young adult, inoculated with 0·1 mg., died in 22 days of acute tuberculosis, tubercle bacilli being very numerous in the marrow and all the organs.

The other cat, older than the latter, inoculated with 1 mg., was killed in apparent good health, 74 days after inoculation, and showed a local ulcer, caseation of the nearest glands, and miliary tuberculosis of the lungs and kidneys.

The three kittens received 1·0, 0·1, and 0·01 mg., and died in 21, 24, and 39 days respectively of acute disseminated tuberculosis, the lungs in each case being severely affected.

GENERAL RESULTS.

The experiments show that tuberculosis is readily set up in cats and kittens by subcutaneous and by intraperitoneal inoculation. Cats are less susceptible than kittens.

In kittens tubercle bacilli, whether inoculated intraperitoneally or subcutaneously, are quickly disseminated over the body, and may, when the dose is sufficiently large, multiply in the tissues so rapidly that death ensues, probably from toxæmia, before definite tuberculous lesions have had time to develop in the internal organs.

CAT 26.

Subcutaneous.—Inoculation of culture obtained from Cow 40 (Virus B I.).

Date.—November 12th, 1904.

Dose.—1·0 milligramme.

Killed.—December 17th, 1904, when very ill. [35 days after inoculation.]

POST-MORTEM EXAMINATION.

Condition.—Very emaciated.

Seat of Inoculation.—At the seat of inoculation, a little to the left of the umbilicus, there was an oval ulcer 1¼ in., by 1 in., with raised, irregular, undermined margins and thickened base; the floor was covered with ill-formed granulation tissue, secreting a yellow discharge.

Left Inguinal Gland.—The size of a swallow's egg, showed part of the cortex opaque, firm, and caseous.

Omentum, Peritoneum.—Normal.

Spleen.—Not apparently enlarged; showed in the pulp numerous grey spherical bodies, about the size of pins' heads (? enlarged Malpighian bodies.)

Liver.—The substance was speckled with minute grey foci.

Portal Gland.—Slightly enlarged; showed one or two caseous foci in the cortex.

Kidneys.—Right kidney showed on the surface two or three suspicious grey foci.

The left kidney and the suprarenal bodies appeared normal.

Lungs.—Were beset with grey miliary tubercles; the cephalic lobes were firm and solid, pieces sinking in water; pieces from the caudal lobes just managed to float; the bronchi were filled with frothy muco-pus.

Bronchial Glands.—Three or four times the normal in size, showed early caseous foci.

Mediastinal Glands.—Ventral mediastinal glands, much enlarged, were firm, yellow, and caseous in more than half their extent; the rest of the glands showed caseous foci.

Microscopical Examination. (*Smear preparation.*)

Ventral Mediastinal Gland *Muco-Pus from Bronchus* -	A few tubercle bacilli.
Liver - - - - -	No tubercle bacilli.

CAT 28.

Subcutaneous.—Inoculation of culture obtained from Cow 40 (Virus B I).

Date.—November 12th, 1904.

Dose—1·0 milligramme.

Killed.—In a dying condition on December 31st, 1904. [49 days after inoculation.]

POST-MORTEM EXAMINATION.

Body.—Very emaciated.

Seat of Inoculation.—At the seat of inoculation, a little to the left side of the umbilicus, there was a tumour measuring roughly 1½ in. by 1¼ in. by ½ in. The skin over it was adherent and infiltrated, and showed a circular ulcer about ½ in. in diameter; the ulcer had thick, abrupt margins, and communicated with a cavity in the centre of the tumour; the cavity was surrounded by thick walls of fibrous tissue, showing here and there opaque yellow foci. The internal walls of the cavity were pinkish and granular, and were covered with flakes of yellow pus.

Inguinal Glands.—On the left side, one, the size of a broad bean, was indurated, and showed on section irregular firm caseated patches throughout the greater part of the cortex; the rest of the gland substance was studded with opaque caseous foci. Three or four smaller glands were beset with discrete caseous foci.

Right Inguinal Glands.—Normal.

Left Axillary Gland.—The size of a French bean, showed on section irregular caseous areas replacing about half the gland substance.

Left Iliac Gland.—The size of a sparrow's egg, was studded with caseous foci, which in two or three places had run together to form irregular patches.

Right Iliac Gland.—Normal.

Omentum, Peritoneum.—Normal.

Spleen.—Not obviously enlarged, showed on section numerous small grey spherical bodies, which were probably slightly enlarged Malpighian corpuscles; there was no sign of caseation.

Kidneys.—Each showed on the surface a grey tubercle the size of a mustard seed.

Liver.—Appeared normal on the surface and on section.

Portal Gland.—Showed a caseous focus.

Mesenteric Glands, Colic Glands.—Normal.

Lungs.—Both lungs were closely packed with grey miliary tubercles, which in the cephalic lobes practically replaced the lung parenchyma; in the caudal lobes there was a small amount of congested emphysematous lung tissue, by virtue of which these lobes, when placed in water, just managed to float; the cephalic lobes sank in water. The majority of the tubercles were homogeneous throughout, but a few were opaque in the centre.

Bronchial Glands.—Were enlarged, congested, and showed early foci of caseation.

Mediastinal Glands.—The ventral mediastinal glands showed irregular caseated patches in the cortices.

Pleura, Heart.—Normal.

Microscopical Examination. (*Smear preparations.*)

Spleen and Kidney.—No tubercle bacilli.

Lung.—Two tubercle bacilli.

Ventral Mediastinal Gland.—Numerous tubercle bacilli.

CAT 32. [Kitten, 8 Weeks old.]

Subcutaneous.—Inoculation of culture derived from Calf 214 [Virus B. III.]

Dose.—1 milligramme.

Date.—March 23rd, 1905.

Initial Weight.—500 grammes

Final Weight.—435 grammes.

Loss in Weight.—65 grammes.

Died.—April 9th, 1905. [17 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous and muscular tissues of the abdominal wall there was a prominent tumour 1½ by 1¼ by ⅔, composed of yellow caseo-necrotic tissue, softened and hæmorrhagic in the central part. The skin was adherent, infiltrated and at one part necrosed and ulcerated.

Inguinal Glands.—An inguinal gland on each side nearest the local lesion was enlarged and caseous throughout; some smaller inguinal glands on each side, more remote from the tumour, showed early caseation.

The Iliac Glands.—Were greatly enlarged, and on section yellow and necrotic throughout.

Axillary Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

The Spleen.—Was not enlarged; close inspection revealed numerous grey specks just visible to the naked eye.

The Liver.—Showed similar grey points throughout the substance.

The Portal Gland.—Was enlarged; no opaque foci were seen.

Kidneys.—Congested; otherwise normal.

Thorax.

The Lungs.—Were congested and showed small patches of consolidation; no tubercles were visible.

The Bronchial Glands.—Appeared normal.

The Sternal Glands.—Were enlarged, firm, and in a state of early caseation and necrosis.

Microscopical Examination. (*Smear preparations.*)

Liver.—Numerous tubercle bacilli.

Spleen.—Numerous tubercle bacilli.

Lungs.—Numerous tubercle bacilli.

Marrow.—Numerous tubercle bacilli.

Sternal Gland.—Very numerous tubercle bacilli.

CAT 31. (Adult.)

Intraperitoneal.—Inoculation of culture derived from Calf 214. [Virus B III.]

Dose.—1 milligramme.

Date.—March 23rd, 1905.

Initial Weight.—2,950 grammes.

Final Weight.—1,650 grammes.

Loss in Weight.—1,300 grammes.

Died.—May 2nd, 1905. [39 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—There was a small irregular thin yellow patch of caseous infiltration in the subcutaneous tissues.

The Inguinal Glands.—Were slightly enlarged and showed small caseous areas in the cortex.

Abdomen.

The Peritoneal Cavity.—Contained a large quantity of clear yellow serous fluid.

The Omentum.—Was retracted and considerably thickened, and showed irregular masses and bands of firm yellow caseating tuberculous tissue; there were similar but smaller masses in the gastro-splenic omentum.

Peritoneum.—The parietal peritoneum showed flakes of lymph and two or three groups of small yellow tubercles on the floor.

The peritoneal surface of the diaphragm was covered with a thin grey membrane, yellowish in patches.

On the mesentery there were a few grey foci and two or three caseous tubercles.

Spleen.—Pale, firm, and not obviously enlarged; no tubercles were seen on section.

The Liver.—Showed over the surface a practically continuous thin grey membrane which readily peeled off; this membrane was speckled with minute greyish white foci; embedded in the substance of the liver under the capsule on the anterior surface there was a yellow caseous nodule, 2 mm. in diameter, with a thin fibrous capsule.

The Kidneys.—Were pale; otherwise normal.

The Portal, Splenic, Coeliac and Lumbar Glands.—Were enlarged and practically caseous throughout.

The Mesenteric, Ileo-colic and Iliac Glands.—Contained numerous caseous foci.

Thorax.

Heart.—Normal

Pleura.—Normal.

Lungs.—The lungs were congested and emphysematous along the margins; there were patches of collapse in the left.

Cephalic Lobes.—On close inspection of the lung minute grey foci were seen under the pleura which appeared to be small tubercles; here and there these foci seemed to have run together and formed grey patches; the tubercles were not sharply defined and could not definitely be made out on section of the lung.

The Bronchial Glands.—Appeared normal.

The Ventral Mediastinial Glands.—Were enlarged and fused together to form a mass the size of a pigeon's egg; they consisted throughout of firm yellow friable caseo-necrotic tissue.

Microscopical Examination. (Smear preparations.)

Spleen.—Moderately numerous tubercle bacilli.

Liver Substance.—A few tubercle bacilli.

Lung.—A few tubercle bacilli.

Ventral Mediastinal Gland.—Swarms of tubercle bacilli.

CAT 36. (Kitten, 8 Weeks Old.)

Intraperitoneal.—Inoculation of culture derived from Calf 214. [Virus B III.]

Dose.—1 milligramme.

Date.—March 23rd, 1905.

Initial Weight.—500 grammes.

Final Weight.—410 grammes.

Loss in Weight.—90 grammes.

Died.—April 9th, 1905. [17 days after inoculation.]

POST-MORTEM EXAMINATION.

In the muscle wall of the abdomen there was a firm caseous nodule the size of a split pea.

Abdomen.

The Omentum.—Was greatly thickened, particularly near the pylorus, where it formed a firm yellow lobulated caseating mass, showing only a very small amount of grey translucent tissue.

Peritoneum.—The parietal peritoneum showed spots of lymph and numerous slender strands of fibrin extending between it and the viscera. On the peritoneal surface of the diaphragm there were about half a dozen pin-head-sized grey tubercles, and running parallel to the fibres of the tendon fine whitish streaks of tuberculous deposit. The mesentery and mesocolon showed a few minute whitish foci; some of these could be scraped away with the finger and were apparently spots of purulent lymph; others seemed to be early tubercles.

The Spleen.—Was a little enlarged and the Malpighian bodies were more conspicuous than normal; no tubercles were seen.

The Liver.—Substance was beset with minute grey pinpoint foci.

The Portal Gland.—Was enlarged and showed numerous early caseous foci.

The Kidneys.—Showed petechial hæmorrhages on the surfaces; each contained a doubtful grey tubercle.

A Pyloric Gland.—Was dense, yellowish white and caseous in half its cortex.

The Coeliac Gland.—Was enlarged and caseous throughout the cortex.

The Lumbar Glands.—Were enlarged, firm, and in a state of early caseation, but less advanced than the coeliac.

The Gastric, Mesenteric, Ileo-colic and Iliac Glands.—Were a little enlarged and contained caseous foci.

Thorax.

Pleura.—Normal.

The Lungs—Were pinkish in colour and normally crepitant; the right cephalic lobe showed a patch of collapse; with this exception the lungs were normal.

The Bronchial Glands.—Contained small caseous foci.

The Ventral Mediastinal Glands.—Were greatly enlarged, dense, yellow, and caseous practically throughout.

Microscopical Examination. (*Smear Preparations.*)

Liver.—Very numerous tubercle bacilli.

Spleen.—Very numerous tubercle bacilli.

Lung.—Very numerous tubercle bacilli.

Sternal Gland.—Very numerous tubercle bacilli.

Marrow (*femur*).—Numerous tubercle bacilli, chiefly in clumps.

CAT 66. (Adult).

Subcutaneous.—Inoculation of culture derived from the original material of Virus B XVIII. [Inoculated at the same time and with some of the same culture as Cat 68.]

Dose.—1·0 milligramme.

Date.—December 12th, 1905.

Initial Weight.—2,600 grammes.

Final Weight.—1,410 grammes.

Loss in Weight.—1,190 grammes.

Died.—February 20th, 1906. [70 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—The skin of the abdomen in the left inguinal region showed an ulcer ¾ in. in greatest diameter, with raised irregular caseous margins, pale granular floor partly covered with a dry caseous scab, and slightly thickened fibroid base.

The Left Inguinal Glands.—Were enlarged and advanced in caseation. The tissues around these glands were thickened and fibroid and contained caseous nodules. The skin over them showed several sinuses, one of which discharged greenish yellow pus.

A Right Inguinal Gland was slightly enlarged and beset with caseous foci.

Axillary Glands.—One on the left mammary vein, near the axilla, was slightly enlarged and beset with coalescing caseous tubercles. A gland in the left axilla was beset with caseous foci.

The axillary glands on the right side showed a few scattered foci.

The Iliac and Lumbar Glands.—Were slightly enlarged and contained fairly numerous discrete caseous tubercles in the cortex.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Normal in colour, showed on the surface as well as on section a few doubtful grey foci.

Portal Gland.—Normal

Kidneys.—The kidneys were pale; each showed on the surface fairly numerous grey tubercles, some with opaque white centres, none larger than 1 mm. in diameter. On section similar tubercles were seen in the depth of the cortex; there was, besides, a number of streaks, grey around the margins, caseous in the centre, 1 mm. or more in breadth, extending radially from the cortex into the medulla; some of these, gradually becoming finer, were continued into the papillary zone, where they ended near the apex of the papilla. There was no pus in the pelvis of either kidney.

Suprarenal Bodies.—Normal.

Coeliac, Mesenteric, and Ileo-colic Glands.—Normal.

Small Intestine.—Normal.

Large Intestine.—Filled with large hard dry scybala.

Thorax.

Heart, Pleura.—Normal.

Lungs.—The lungs were normal in general appearance; in each caudal lobe there was a caseous nodule, grey around the periphery, the largest the size of a small pea; in one of these lobes there was, besides, a miliary caseous tubercle, and in the other a translucent nodule, 3 mm. in diameter. The rest of the lung was normal.

Bronchial and Ventral Mediastinal Glands.—Normal.

Pharnyx and Tonsils.—Normal.

Pharyngeal Glands.—Slightly indurated; no opacities.

Thyroid.—Both lobes of the thyroid were beset with discrete caseous tubercles, up to 1 mm. or more in diameter.

Microscopical Examination. (*Smear Preparations*).

Spleen *Liver*	No tubercle bacilli.
Pharyngeal Gland *Thyroid Body*	A few tubercle bacilli.
Kidney.	Moderately numerous tubercle bacilli.

CAT 68. (Kitten.)

Subcutaneous.—Inoculation of culture derived from the original material of Virus B XVIII.

Dose.—1 milligramme.

Date.—December 12th, 1905.

Initial Weight.—970 grammes.

Died.—January 6th, 1906. [25 days after inoculation.]

POST-MORTEM EXAMINATION.

The body was partly eaten by a companion cat (No. 66). The following could be examined:—

A Right Axillary Gland.—Was enlarged and showed the greater part of its substance yellow and caseous.

A Right Inguinal Gland.—Showed early caseation in the cortex.

A Left Axillary Gland.—Was slightly enlarged, but not caseous.

A Small Piece of Spleen.—Showed no evidence of tuberculosis.

A Portion of Liver.—Was speckled with minute greyish yellow points.

Each Kidney.—Contained a minute translucent tubercle in the cortex.

Suprarenal Bodies.—Normal.

Thorax.

Portions of the lungs remained. The left lung was pinkish and crepitant; no tubercles were seen. The right lung was congested (hypostatic), and showed some scattered grey foci of a doubtful nature (? early tubercles.)

Microscopical Examination. (*Smear Preparations.*)

Spleen *Kidney*	Very numerous tubercle bacilli, chiefly in clumps.
Liver - - - *Lung (right and left)*	Numerous tubercle bacilli.

CAT 84. (Kitten.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B XXVIII.

Dose—1·0 milligramme.

Date—June 1st, 1906.

Initial Weight—430 grammes. Final weight—450 grammes.

Died—June 22nd, 1906. [21 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the mid-line of the abdomen there was a tumour measuring $1\frac{1}{4}$ in. by 1 in. by $\frac{1}{2}$ in., composed of yellow caseo-necrotic breaking down material, the skin over which was ulcerated and necrotic ; the tumour infiltrated the whole thickness of the muscle wall but did not involve the peritoneum.

Neighbouring Glands.—In the right inguinal region there was a tumour the size of a thrush's egg composed of yellow caseo-necrotic substance, softening and breaking down near the skin which was adherent, necrotic and ulcerated.

In the left inguinal region there was a similar but slightly smaller tumour.

Right Pudic Gland.—Size of a pea, firm, yellow and caseo-necrotic throughout.

Right Axillary Gland.—Was slightly enlarged and showed early necrosis chiefly in the central part of the gland.

Left Axillary Gland.—The size of a broad bean, was yellow, caseo-necrotic throughout and at one part softened.

Pectoral Glands.—A left pectoral gland was very slightly enlarged and showed very early necrosis in the cortex. A right pectoral gland was slightly enlarged and showed early caseation in the cortex.

Iliac Glands.—Were much enlarged, particularly on the right side ; the latter were firm and yellow throughout. The glands on the left side showed an earlier stage of necrosis.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Pale, not apparently enlarged ; the pulp was speckled with minute grey points.

Liver.—Was a little paler than normal and peppered with grey translucent foci ranging in size from that of a point just visible to the naked eye up to rather less than 0·5 mm.

The Portal Gland.—Not enlarged, showed a number of minute greyish white points in the cortex.

Kidneys and Suprarenal Bodies.—Appeared normal.

Cœliac Glands.—Contained some doubtful greyish points.

Mesenteric Glands.—Appeared normal.

Thorax.

Lungs.—Were œdematous-looking and firmer than normal ; the left lobes were congested and appeared as if infiltrated throughout with grey foci, forming a network ; the right lobes also had a grey infiltrated appearance, less definite than in the left lobes on account of the absence of congestion.

Bronchial Glands.—Were not enlarged ; they showed a few early tubercles in the cortices.

Sternal Glands.—Were fused together and formed a mass the size of a small filbert. On section they were yellow and caseous throughout.

Heart and Pleura.—Normal.

Microscopical Examination. (*Smear Preparations.*)

Spleen.—Numerous tubercle bacilli.

Kidney } Numerous tubercle bacilli, many in clumps ;
Liver } many of the clumps appeared to be inside cells.

Lungs.—Very numerous tubercle bacilli.

Marrow.—Numerous tubercle bacilli in clumps.

Sternal Gland.—Swarms of tubercle bacilli.

CAT 80. (Kitten.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B XXVIII.

Dose—0·1 milligramme.

Date—June 1st, 1906.

Initial Weight—430 grammes. Final weight—500 grammes.

Died—July 5th, 1906. [34 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the skin of the abdomen there was an oval ulcer 1¼ in. by 1 in., with raised everted irregular margins, uneven floor covered with caseo-pus and thickened congested fibroid base.

Left Inguinal Gland.—The left inguinal gland was the size of a French bean and showed half its substance composed of yellowish white firm but friable caseated tissue; in the rest of the gland there were a few caseous foci.

Right Inguinal Gland.—The size of a kidney bean, was partly caseous.

Pudic Gland.—On the left side, the size of a small pea, showed part of the cortex caseous.

Axillary Glands.—On the right side there were two enlarged glands; one was composed practically throughout of yellowish white caseated tissue; the other was partly caseous.

Axillary Glands.—The gland on the left side showed more or less discrete caseous tubercles.

Left Iliac Gland.—Was enlarged, and beset with small caseous foci; the right was similar, but the foci were not so numerous.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Slightly enlarged, was closely beset with grey translucent tubercles, with no sign of central caseation, the largest the size of a millet seed; the tubercles projected from the surface of the spleen.

Liver.—Was pale and contained numerous evenly distributed grey homogeneous tubercles, the largest about 1 mm. in diameter.

Portal, Cœliac, and Lumbar Glands.—Appeared normal.

Kidneys.—Contained fairly numerous grey tubercles, the largest 1 mm. in diameter; a few of the larger ones showed minute opacities in the centre.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—Did not collapse and were abnormally firm; they were closely beset with grey miliary tubercles everywhere becoming confluent; the cephalic lobes were almost completely consolidated; the right middle lobe sank in water; pieces from the caudal lobes floated; a good many of the tubercles had minute opaque white centres.

Bronchial Glands.—Were enlarged and showed early foci of caseation in the cortices.

Sternal Glands.—Were enlarged and irregularly caseated.

Pleura, Heart.—Normal.

Submaxillary, Cervical and Pharyngeal Glands.—Normal.

Mesenteric Glands.—Not enlarged, showed one or two small tubercles.

Microscopical Examination (Smear Preparations).

Lung, *Marrow*	A few tubercle bacilli.
Liver, - - *Bronchial Gland*	Numerous tubercle bacilli.

CAT 82. (Kitten.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B XXVIII.

Date—June 1st, 1906.

Dose—0·01 milligramme.

Initial Weight—460 grammes. Final weight—500 grammes.

Died—July 10th, 1906. [39 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—On the left side of the abdomen there was a tumour measuring 1¼ in. by 1¼ in. by ½ in., the skin over nearly the whole of which was ulcerated; the ulcer was partly covered by a dry caseous scab; on section the tumour showed around the margins translucent fibroid caseating tissue, and in the centre soft yellow caseo-purulent material.

Left Inguinal Gland.—Was much enlarged and showed the greater part of its substance composed of firm yellowish white caseated tissue; the rest of the gland contained irregular caseous foci.

Right Inguinal Gland.—Was little if at all enlarged, and contained a few caseous foci.

Axillary Glands.—A gland near the left axilla was slightly enlarged and showed a patch of early caseation in the cortex; two other glands, slightly enlarged, appeared normal on section. Right axillary glands normal.

Left Iliac Gland.—Was enlarged and beset with early caseous foci. The right iliac gland was not apparently affected.

Abdomen:

Omentum and Peritoneum.—Normal.

Spleen.—Was a little enlarged and contained scattered nodules ranging in size from a pin's head to a little larger than a millet seed; the larger ones were yellow and caseous, the smaller ones grey and translucent.

Liver.—Was pale and contained a moderate number of semi-transparent tubercles, with no sign of caseation, the largest about 1 mm. in diameter.

Portal Gland.—Was slightly enlarged and showed a few caseous foci.

Kidneys.—Both kidneys showed in the cortex numerous cysts, filled with clear fluid, the largest the size of a millet seed.

Suprarenal Bodies.—Normal.

Mesenteric, Ileo-colic, Colic and Lumbar Glands.—Normal.

Thorax.

Lungs.—Were enlarged and firm, and collapsed very slightly. The cephalic lobes and the right middle lobe were quite airless, except for the extreme tips which were emphysematous, and packed with confluent grey tubercles; here and there a tubercle showed a minute opaque centre. The caudal lobes were also infiltrated with grey coalescing tubercles and were quite airless, except along the margins which were emphysematous.

Bronchial Glands.—Were larger and firmer than normal; on section they showed greyish patches in the cortex (paler in colour than the surrounding gland tissue), but no foci of necrosis.

Heart and Pleura.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Tonsils and Intestines.—Normal.

Microscopical Examination. (*Smear Preparations.*)

Marrow.—No tubercle bacilli found.

CAT 76. (Young Adult.)

Subcutaneous—Inoculation of culture derived from the original material of Virus B. XXVIII.

Dose—0·1 milligramme.

Date—June 1st, 1906.

Initial Weight—1,630 grammes. Final weight—1,210 grammes.

Died—June 23rd 1906. [22 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—The skin over the costal cartilages on the left side near the margin of the thorax showed an oval ulcer, 1 in. in length by ¾ in. in breadth, with irregular raised undermined margins and uneven necrotic floor.

Neighbouring Glands: The left xiphisternal gland.—The size of a large pea, was yellow and necrotic throughout and softened in the centre.

A gland on the left mammary vein, 2 in. from the axilla, the size of a large broad bean, was composed throughout of yellow caseo-necrotic partially softened material. A gland in the left axilla, the size of a pea, was hæmorrhagic, but showed no foci of necrosis.

A gland on the right mammary vein, the size of a kidney bean, showed some soft canary yellow necrotic patches in the cortex.

A gland in the right axilla resembled the corresponding one on the left side.

Inguinal Glands.—The left was slightly enlarged, deeply congested and showed in the cortex three or four soft yellow tubercles. Right inguinal gland normal.

Iliac and Lumbar Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Was enlarged and showed in the pulp numerous minute grey points.

Liver.—Substance was speckled with minute greyish and greyish yellow foci, there were also numerous minute petechial points of hæmorrhage.

Portal Gland.—Was enlarged, hæmorrhagic and contained a number of yellow caseous miliary tubercles.

Kidneys.—Were pale and showed on the surface numerous small hæmorrhages, up to 1 mm. in diameter; no tubercles were seen.

Thorax.

Lungs.—Were firmer than normal, œdematous and congested; there were no patches of consolidation and no tubercles were seen.

Bronchial Glands.—Were a little enlarged and showed yellow foci of necrosis in the cortices.

Sternal Glands.—Were enlarged, hæmorrhagic, yellow and caseous around the margins.

Pleura.—Normal.

Heart.—Mottled on the surface with hæmorrhages; no tubercles seen.

Pharynx.—Tonsils and neck glands normal.

Mesenteric and Ileo-Colic Glands.—Were somewhat enlarged; on section they were dark red and presented here and there minute yellow points.

Colic and Cœliac Glands.—Dark red: no foci of necrosis seen.

Microscopical Examination. (*Smear Preparations.*)

Spleen.—Numerous tubercle bacilli.

Lungs, *Marrow.* } Numerous tubercle bacilli, chiefly in clumps.

Liver.—Moderately numerous tubercle bacilli.

Kidney.—No tubercle bacilli found.

CAT 78. (Adult).

Subcutaneous—Inoculation of culture derived from the original material of Virus B. XXVIII.

Date—June 1st, 1906.

Dose—1·0 milligramme.

Initial Weight—2,200 grammes. Final weight—1,810 grammes.

Killed—In good health, August 14th, 1906. [74 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—The skin of the abdomen near the xiphisternum showed a shallow ulcer $\frac{3}{4}$ in. by $\frac{1}{2}$ in. with a reddish floor; on section the base of the ulcer, 3 mm. in greatest thickness, was composed of firm greyish red tissue containing small yellowish white patches and streaks of caseation.

Axillary Glands.—In the right axilla there were two glands; one, the size of a split pea, was composed practically throughout of dense yellowish white caseous substance; the other, the size of a French bean, was irregularly caseated around the periphery of the cortex. Two glands in the left axilla were slightly enlarged; one was partly caseous; the other contained a very small caseous patch. The inguinal glands appeared normal.

Thorax.

Lungs.—The lungs were larger and firmer than normal; they showed on the surface under the pleura extremely numerous hard grey semi-transparent tubercles somewhat irregular in outline, the largest not more than 1 mm. in diameter; on section similar tubercles were closely and evenly disseminated throughout the lung parenchyma; they stood up from the cut surface, the larger ones, chiefly, being slightly opaque in the centre. In one caudal lobe near the margin there was a group of three caseous tubercles, the largest the size of a millet seed. There were no patches of consolidation.

Bronchial Glands.—Normal to the eye.

A Ventral Mediastinal Gland.—The size of a French bean; was composed practically throughout of dense yellowish white caseated tissue.

Heart and pleura normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal in size; on section a few of the Malphigian bodies seemed enlarged, but were without central necrosis.

Liver.—Normal.

Portal Gland.—Normal.

Kidneys.—Each kidney showed on the surface a moderate number of light grey translucent tubercles, the majority of which were slightly caseous in the centre; they ranged in diameter up to 2 mm. and on section were elongated in a radial direction, some extending a considerable distance into the medulla; there was no pus in the pelvis of the kidney.

Suprarenal Bodies.—Normal.

Coeliac, Lumbar, Iliac, Mesenteric, Ileo-Colic and Colic Glands.—Normal.

Tongue, Tonsils, Pharynx and Glands in Neck—Normal.

SUMMARY OF INOCULATION EXPERIMENTS ON THE CAT WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN.

Virus.	Number of Cat.	Age and weight.	Dose.	Method of Inoculation.	Duration of Life.	Killed or died.	Post-mortem Results.
B. I.	26	Adult	1·0 mg.	Subcutaneous	35 days	Killed, ill	Local caseous ulcer ; adjoining gland caseous ; sternal glands caseous ; lungs beset with miliary tubercles ; caseous foci in portal and bronchial glands.
B. I.	28	Adult	1·0 mg.	Subcutaneous	49 days	Killed, dying	Ulcerated caseous lesion ; neighbouring glands caseous ; miliary tuberculosis of lungs ; caseous foci in bronchial and mediastinal glands ; grey tubercle in each kidney.
B. III.	34	Adult 2,950 g.	1·0 mg.	Intraperitoneal	39 days	Died	Tuberculous peritonitis ; enlargement and caseation of the abdominal and ventral mediastinal lymphatic glands ; early tuberculosis of the lungs ; one caseous nodule in liver ; no tubercles in kidneys or spleen.
B. III.	32	8 weeks 500 g.	1·0 mg.	Subcutaneous	17 days	Died	Ulcerated caseo - necrotic lesion ; caseation of nearest glands ; numerous minute grey points in liver and spleen ; no tubercles seen elsewhere. Tubercle bacilli numerous throughout the body.
B. III.	36	8 weeks 500 g.	1·0 mg.	Intraperitoneal	17 days	Died	Tuberculous peritonitis ; enlargement and caseation of abdominal and thoracic lymphatic glands ; numerous pin-point foci in the liver ; no tubercles seen elsewhere. Tubercle bacilli were very numerous everywhere.
B. XVIII.	66	Adult 2,600 g.	1·0 mg.	Subcutaneous	70 days	Died	Local ulcer ; adjacent glands caseous ; the lungs contained 4 nodules ; there were numerous grey tubercles in the kidneys and a few doubtful tubercles in the liver ; the thyroid body was beset with caseous tubercles.
B. XVIII.	68	Kitten 970 g.	1·0 mg.	Subcutaneous	25 days	Died	The body was partly eaten ; there had been a local ulcer ; the adjacent glands were caseous ; the liver was speckled with small points ; there was a translucent tubercle in each kidney ; a congested portion of lung contained grey points. Tubercle bacilli were numerous in all the organs.
B.XXVIII	76	Young adult 1,630 g.	0·1 mg.	Subcutaneous	22 days	Died	Local ulcer ; neighbouring glands caseous ; lungs firm, œdematous and congested, no tubercles seen ; spleen and liver speckled with minute grey points ; bronchial and portal glands showed caseous foci. Tubercle bacilli were numerous in the organs and marrow.
B.XXVIII	78	Adult 2,200 g.	1·0 mg.	Subcutaneous	74 days	Killed in apparent good health.	Local ulcer ; tuberculosis of nearest glands ; lungs closely beset with hard grey miliary tubercles ; there was a moderate number of tubercles in each kidney ; other organs were normal.
B.XXVIII	82	Kitten 460 g.	0·01 mg.	Subcutaneous	39 days	Died	Ulcerated caseous lesion ; nearest glands enlarged and caseous ; miliary tuberculosis of lungs (severe), spleen and liver.
B.XXVIII	80	Kitten 430 g	0·1 mg	Subcutaneous	34 days	Died	Local tuberculous ulcer ; caseation of nearest glands : miliary tuberculosis of all the organs.
B.XXVIII	84	Kitten 430 g.	1·0 mg.	Subcutaneous	21 days	Died	Ulcerated caseous lesion ; nearest glands enlarged and caseous ; lungs infiltrated with grey tubercles ; spleen and liver speckled with grey points ; caseous foci in bronchial and portal glands. Tubercle bacilli numerous in the organs and marrow.

INOCULATION EXPERIMENTS ON THE MONGOOSE AND HEDGEHOG.

MONGOOSES.

Two Mongooses were inoculated, one subcutaneously and one intraperitoneally, each with 1 mg. of culture from Virus B. IX.

Both animals died 29 days after inoculation.

The subcutaneous animal showed a local lesion, caseation and softening of an inguinal and a portal gland and of two gastric glands, minute grey points in the liver and spleen, one grey tubercle in a kidney, two soft yellow nodules in the heart muscle and a soft yellow nodule in a lumbar gland. Bacilli were very numerous everywhere.

The intraperitoneal animal showed tuberculous peritonitis, caseation and softening of the portal and sternal glands, discrete tubercles in the mesenteric, iliac, and lumbar glands and minute grey points in the substance of the spleen. Bacilli were numerous in the abdominal organs and very numerous in the peritoneal exudate.

Both of the animals appeared to have died of acute tuberculosis, death occurring too early for definite lesions to form in the internal organs.

MONGOOSE 4.

Subcutaneous.—Inoculation of culture from the original material of Virus B. IX.

Dose.—1.0 milligramme.

Date.—July 10th, 1905.

Died—August 8th, 1905. [29 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the abdominal subcutaneous tissues there was an irregular congested and œdematous caseating patch, 2 inches by ¾ inch.

Right Inguinal Gland.—Appeared normal.

The Left Inguinal Gland.—Was enlarged and showed about half its substance replaced by yellow caseo-pus.

The Iliac Glands.—Appeared normal.

One Lumbar Gland.—Contained a soft yellow nodule the size of a wheat grain; another was normal.

The Spleen.—Was enlarged (3½ in. by ¾ in. by ¼ in.) and was finely peppered with minute grey foci.

Liver.—Numerous grey points were seen throughout the substance.

Portal Gland.—Yellow and softened throughout.

A gland in the lesser curvature of the stomach was enlarged (¾ in. in length), soft, œdematous and caseating throughout.

A Precardiac Gland, ¼ in. in length, was on section yellow and softened.

Left Kidney.—Normal.

Right Kidney.—Contained a grey tubercle about 1 mm. in diameter.

Thorax.

Heart.—In the heart muscle there were two yellow nodules, projecting from the surface, one a little less than a wheat grain, the other about the size of a pin's head. On section both were found to be softened.

Lungs.—Crepitant; showed nothing of a tuberculous nature.

Bronchial Glands.—Normal.

Axillary, Submaxillary, and Mesenteric Glands.—Normal.

Microscopical Examination. (*Smear Preparations.*)

Local Tumour.—Swarms of tubercle bacilli, also numerous cocci.

Gland in Small Omentum *Portal Gland* *Inguinal Gland* *Heart* *Spleen*	Swarms of tubercle bacilli.
Liver *Kidney* *Lumbar Gland*	Numerous tubercle bacilli.

MONGOOSE 6.

Intraperitoneal.—Inoculation of culture from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—July 10th, 1905.

Died.—August 8th, 1905. [29 days after inoculation]

POST-MORTEM EXAMINATION.

The Abdominal Cavity.—Was distended and filled with turbid fluid, and contained collections of coagulated lymph.

The Omentum.—Was thickened along its free margin and contained yellow purulent nodules.

The Mesentery.—Showed numerous grey foci, collected together to form small opaque greyish areas.

Intestines.—There were three pin-head-sized yellowish tubercles on the serous surface.

Spleen.—The spleen was enlarged, and the substance from the surface showed a grey peppered appearance.

Liver.—Appeared normal.

The Portal Gland.—Was caseous and softened throughout.

The Mesenteric, Lumbar and Iliac Glands.—Contained pin-head-sized tubercles, with yellow softened centres.

Kidneys.—Appeared normal.

Thorax.

Heart.—Normal.

Lungs.—Normal.

The Sternal Glands.—Were greatly enlarged, yellow, and softened throughout.

Superficial Lymphatic glands.—Normal.

Microscopical Examination.—(*Smear Preparations.*)

Abdominal Lymph, } Numerous leucocytes, all filled
Peritoneal Fluid. } with tubercle bacilli.

Spleen.—Numerous tubercle bacilli.

Liver, } Moderate number of tubercle bacilli.
Kidney. }

Lung.—No tubercle bacilli.

HEDGEHOGS.

Six hedgehogs have been inoculated, three intraperitoneally and three subcutaneously; two were inoculated with milk containing 50,000 tubercle bacilli. and four with culture from Virus B. IX., the dose in each case being 1·0 mg.

One hedgehog, inoculated subcutaneously with milk, died in 45 days and showed a local lesion and caseation of the nearest glands only.

Another hedgehog, inoculated with the same dose intraperitoneally, died 97 days later, and showed a mild form of general tuberculosis.

Two hedgehogs were inoculated subcutaneously with culture; both animals died, one 42, the other 31 days after inoculation. In each case there was a local lesion, caseation of the nearest glands, miliary tubercles in the kidneys and lungs and in one case in the spleen also.

Two were inoculated intraperitoneally; one died 8 days later of an acute infection; the other died in 19 days and showed tuberculous peritonitis only.

GENERAL RESULTS.

Inoculation experiments on hedgehogs have not been numerous, but they are sufficient to show that this animal can be infected with the bovine tubercle bacillus.

As to their relative susceptibility it is not possible to make a definite statement; most of the animals died prematurely, on account, no doubt, of their not being able to procure their natural food (their food in captivity consisted of milk, bread, and eggs). They do not, however, appear to be very susceptible, and are certainly less susceptible than rabbits or guinea-pigs.

A fact of some interest in connection with all the animals inoculated subcutaneously may be here referred to. The inoculation was made under the skin of the abdomen, somewhere between the sternum and the pubis. In all three animals the inguinal glands were more or less normal, whilst the axillary glands and glands along the internal mammary vein were caseous. It would appear from this that the lymphatics draining the wall of the abdomen passed, contrary to what occurs in the rabbit or guinea-pig, almost exclusively in an anterior direction.

HEDGEHOG 6.

Subcutaneous.—Inoculation of milk of Cow 164.

Amount of Milk.—5·0 cubic centimetres.

Number of Tubercle Bacilli.—50,000

Date.—July 14th, 1905.

Died.—August 28th, 1905. [45 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the abdominal wall on the right side there was a somewhat flattened swelling, measuring abou 1 in. by ½ in.; this on section was a cyst with fibroid walls and greenish yellow purulent contents; the walls of the cyst were beset with yellow foci.

To the right of the pubis the subcutaneous tissues showed a small collection of thick yellow pus.

The Inguinal Glands.—Were normal.

Arranged along the right mammary vein, between the local lesion and the axilla, there was a series of enlarged glands; five of these, each about the size of a split pea, showed softened caseous nodules and foci.

Other Lymphatic Glands and all the organs were normal to the naked eye.

Microscopical Examination.—(*Smear Preparations.*)

Local Lesion.—Very numerous tubercle bacilli.

Axillary Gland.—Moderately numerous tubercle bacilli.

Collection of Pus over Pubis.—No tubercle bacilli.

HEDGEHOG 8.

Intraperitoneal.—Inoculation of milk of Cow 164

Amount of Milk.—5·0 cubic centimetres.

Number of Tubercle Bacilli.—50,000.

Date.—July 14th, 1905.

Died.—October 19th, 1905. [97 days after inoculation.]

POST-MORTEM EXAMINATION.

The Omentum.—Was closely studded with pin-head-sized pearly translucent tubercles, few of which showed any sign of central opacity.

Parietal Peritoneum.—There was one small prominent tubercle on the floor of the abdomen.

The diaphragm showed on the peritoneal surface about ten pin-head-sized tubercles, with opaque centres.

The Spleen.—Contained from fifteen to twenty translucent grey nodules, 1·5 to 3 mm. in diameter, slightly opaque in the centre.

The Liver.—Showed on the surface beneath the capsule about 24 tubercles, the largest the size of a pin's head; many of these were opaque in the centre; similar tubercles were scattered about in the depth of the substance.

Portal Gland.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

The Lumbar Glands.—Were slightly enlarged and contained caseous foci.

One Mesenteric Gland was indurated and slightly enlarged, and showed on section small caseous foci.

Thorax.

Lungs.—The right lung showed two translucent tubercles 2 mm. in diameter, one of which was opaque in the centre.

In the left lung there were four small translucent tubercles.

Bronchial Glands.—Normal.

Ventral Mediastinal Glands.—Enlarged, indurated, and studded with caseating tubercles.

Microscopical Examination. (*Smear Preparations.*)

Ventral Mediastinal Gland, *Liver.*	A few tubercle bacilli.
Kidney, *Spleen,* *Mesenteric Gland.*	No tubercle bacilli.

HEDGEHOG 22.

Subcutaneous.—Inoculation of culture derived from Virus B. IX

Dose.—1.0 milligramme.

Date.—September 11th, 1905.

Died.—October 23rd, 1905. [42 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation on the left side of the abdomen there was an oval ulcer ¾ inch in greatest diameter; the margins were raised, thickened and undermined; the floor was congested and granular, and showed under the overhanging skin some soft caseo-pus.

The Inguinal Glands.—Were congested and slightly enlarged, the left more than the right; no opaque foci were seen.

Axillary Glands.—On the left side one showed the outer part of the cortex yellow and caseous; another showed a small patch of caseation in the cortex; two others were a little enlarged but not caseous.

On the right side there was a moderately large gland which showed a narrow zone of caseation around the greater part of the periphery; the rest of the gland was congested and translucent. Other glands on this side were enlarged but not opaque.

Abdomen.

The Spleen.—Was enlarged and soft; the Malpighian corpuscles were enlarged; there was no necrosis.

Liver.—Soft and somewhat pale; no definite tubercles were seen.

Kidneys.—The right kidney showed on the surface five grey tubercles, the largest the size of a pin's head.

In the left kidney there were one or two doubtful tubercles.

Thorax.

The Lungs.—Showed a moderate number of grey translucent tubercles, ranging from about 0·5 to 1·5 mm. in diameter; they were homogeneous throughout, with the exception of two or three of the larger ones, which were very slightly opaque in the centre.

The Bronchial Glands.—Appeared normal.

The Sternal Glands.—Were enlarged, that on the left side being twice the size of that on the left; neither was caseous.

Microscopical Examination. (*Smear Preparations.*)

Axillary Gland.—Numerous tubercle bacilli.

Kidney - *Spleen* -	A few tubercle bacilli.

Lung.—Moderately numerous tubercle bacilli.

Inguinal Gland - *Sternal Gland* - *Liver* - *Marrow* -	No tubercle bacilli.

HEDGEHOG 24.

Intraperitoneal.—Inoculation of culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—September 11th, 1905.

Died.—September 30th, 1905. [19 days after inoculation.]

POST-MORTEM EXAMINATION.

The Peritoneal Cavity contained turbid brownish fluid.

Omentum.—Thickened, retracted and adherent to surrounding structures, composed of greyish red caseating tissue. The intestines, spleen, liver and omentum were matted together by fibrino-purulent lymph ; the intestines were glued to the floor of the abdomen.

Parietal Peritoneum.—On the floor of the abdomen there were some irregular patches of adherent lymph.

Mesentery.—There were a few minute grey tubercles on the mesentery.

Mesenteric Glands.—Normal.

The Spleen.—Was very large and contained fairly numerous yellowish necrotic tubercles, irregular and rather indefinite in outline.

The Liver.—Was covered with a layer of lymph ; in the substance numerous minute grey specks could be seen.

The Portal Gland.—Was enlarged ; there was no caseation. The coeliac gland showed early caseation.

Kidneys.—One showed on the surface a suspicious grey point ; the other was normal.

The Lungs and Bronchial Glands.—Were normal.

Microscopical Examination. (*Smear Preparations.*)

Spleen.—Numerous tubercle bacilli.

Liver.—One tubercle bacillus.

HEDGEHOG 26. (Young.)

Subcutaneous.—Inoculation of culture from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—September 11th, 1905.

Died.—October 12th, 1905. [31 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the mid-line of the abdomen there was an ulcer $\frac{3}{4}$ in. in diameter, with undermined margins and thick caseous base.

The Inguinal Glands.—Appeared enlarged, but were not otherwise abnormal.

Axillary Glands.—In the right axilla there was a group of four glands, the largest the size of a small pea; one of these showed part of the cortex opaque, white and caseous; in another there was a narrow line of early caseation around part of the periphery of the gland; the others were normal.

In the left axilla there was a group of three glands, the largest the size of a small bean; two of these were slightly opaque around the margins; the other was normal.

The Pectoral Glands.—On each side were enlarged and firmer than normal; the one on the right side contained a congested caseous tubercle.

The Spleen.—Was enlarged, pale, and showed on section enlargement of the Malpighian corpuscles, many of which were very slightly opaque in the centre; there were also two or three small greyish white necrotic patches.

The Liver.—Was very pale and speckled with yellow points, which were apparently the centres of lobules; no definite tubercles were seen.

Portal Glands.—Normal.

Kidneys.—In the fresh condition the kidneys appeared normal; after being placed in 10 per cent. formol they showed in the cortex a number of greyish white tubercles, the largest the size of a pin's head. (In the fresh condition these were probably transparent, and so were overlooked.)

Iliac and Lumbar Glands.—Normal.

Thorax.

The Lungs.—Were pinkish and crepitant; they contained fairly numerous grey tubercles ranging in size from a mere point up to about 1 mm. in diameter.

Bronchial Glands.—Normal in size and appearance.

The Ventral Mediastinal Glands.—Were enlarged, congested, and oedematous but not opaque.

The Blood.—Was deficient in haemoglobin and clotted badly, separating a milky looking fluid on standing; there was no leucocytosis.

Microscopical Examination. (*Smear Preparations.*)

Caseous Left Axillary Gland -	Very numerous tubercle bacilli.
Spleen (Malphigian body and necrotic patch) - - - -	
Lung - - - - -	Numerous tubercle bacilli.
Ventral Mediastinal Gland -	
Right Inguinal Gland -	Moderately numerous tubercle bacilli.
Liver - - - -	

HEDGEHOG 28.

Inoculated intraperitoneally with 1 mg. of culture from Virus B. IX

Died.—8 days later of an acute infection.

POST-MORTEM EXAMINATION.

The Peritoneal Cavity.—Contained turbid, blood-stained fluid.

The Omentum—Was rolled up but not thickened; on spreading it out small discrete pearly tubercles were seen.

There were a few grey foci on the mesentery.

Spleen.—Swollen, dark red and full of blood.

Liver.—Mottled, with numerous dark red haemorrhagic patches.

Other Organs and all Lymphatic Glands—Normal.

Microscopical Examination. (*Smear Preparation.*)

Peritoneal Fluid.—Pus cells, no tubercle bacilli.

Spleen - - - -	No tubercle bacilli.
Liver (two smears) -	
Mesenteric Gland - -	

INOCULATION EXPERIMENTS ON RABBITS.

INOCULATION EXPERIMENTS ON RABBITS WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

WITH TISSUE EMULSIONS.

Thirty-three rabbits have been inoculated with emulsions from eighteen of the bovine viruses.

In eight instances the tuberculous material was obtained from an experimental bovine and in one from a rabbit; in all the others the emulsions were made from the original material.

Two of the rabbits were inoculated intravenously, nineteen intraperitoneally, and twelve subcutaneously.

Three of the rabbits inoculated intraperitoneally died prematurely, one from injury and two from acute infection.

All the others died of general tuberculosis; the duration of life varied from 36 to 45 days for the animals inoculated intravenously, 26 to 124 days for those inoculated intraperitoneally and 62 to 142 for those inoculated subcutaneously.

The type of disease produced by the inoculation of the tissue emulsions was essentially the same, for the respective modes of inoculation, as that produced by the inoculation of culture.

WITH CULTURES.

Cultures from 30 different bovine viruses have been inoculated into rabbits, intravenously, intraperitoneally, and subcutaneously.

The cultures were obtained in 20 cases direct from the original material and in 8 from rabbits or guinea-pigs inoculated with original material; in a few cases the culture used was obtained from an experimental bovine.

The total age of the culture, estimated from the date the first cultures were sown from the original material to the date of inoculation of the culture, has varied in different cases from 94 to 1,002 days. The generation of the cultures has varied from the 3rd to the 18th.

The age of the sub-culture inoculated has usually been about three weeks.

The cultures have been grown on solidified serum, without the addition of glycerin. The medium most frequently used has been adult bovine serum. At first the cultures were grown exclusively on pig serum; then dog serum was occasionally employed; both had to be given up on account of the difficulty of obtaining an adequate supply.

The doses employed have been chiefly 1·0 mg. and 0·1 mg., but recently 0·01 mg. has been largely used. In special cases smaller and larger doses have been inoculated.

Estimation of the Doses.

For the method of estimating the doses, *see* page 30; each dose was contained in 1 cc. of normal saline.

GENERAL RESULTS.

Intravenous Inoculations.

After an intravenous inoculation of 0·1 mg. of culture the rabbit has died of an acute generalised tuberculosis in from 11 to 34 days, the average period being 21 days; the great majority of the rabbits have died in periods varying from 18 to 24 days.

On post-mortem examination the appearances in typical cases are as follows: The lungs do not collapse and are closely beset with miliary caseating tubercles which, in many cases, cause complete consolidation of the small anterior lobes. Exceptionally the lungs are normally crepitant and contain discrete tubercles. The bronchial glands are enlarged, œdematous, and congested, and contain caseous nodules varying in size in different cases. The spleen is much swollen and speckled with minute tubercles which are most plainly visible through the capsule. The liver shows throughout the substance extremely numerous minute grey points; these may be quite distinct one from another; more often they are indefinite in outline and diffusely infiltrate the liver substance.

The kidneys contain a variable number of miliary tubercles; sometimes, when the duration of life is short, none can be seen; in others they are very numerous. Lymphatic glands, except the bronchial, are not usually affected, but in rabbits which live 21 or more days all the glands throughout the body may contain caseous tubercles.

Tubercles are often seen on the endocardium of the heart and sometimes in the muscle substance.

Microscopically tubercle bacilli are very numerous in all the lesions, and may be found in considerable numbers in the marrow.

The marrow of the ribs always contains tubercles which are seen through the pleura as small greyish-white opaque patches.

When 1·0 mg. of culture is inoculated intravenously a more acute tuberculosis is set up than when 0·1 mg. is inoculated and the rabbits die in periods varying from 10 to 21 days; the type of disease produced, however, in the two cases is essentially the same.

Intraperitoneal Inoculations.

After an intraperitoneal inoculation of 1 mg. of culture the rabbit dies of general tuberculosis in from 11 to 31 days, the average duration of life being 19·2 days.

On post-mortem examination the omentum is found thickened and retracted and composed of firm greyish-red translucent tissue containing streaks and patches of caseation. The parietal and visceral peritoneum are profusely covered with small tubercles, which are always more thickly crowded on the mesentery and meso-colon than anywhere else; tubercles are often quite as numerous on the serous surface of the large intestine as on the mesentery, and there may be lines of caseous deposit (composed of aggregated tubercles) in all the transverse sulci.

The spleen is sometimes greatly enlarged and beset with minute tubercles, as after an intravenous inoculation; often this organ is slightly enlarged and shows only a few or no tubercles in the pulp (this has been the case when the animal has lived relatively a short time); sometimes the spleen is normal in size and appearance, except for a few tubercles on the surface.

The liver almost always contains extremely numerous minute grey foci.

The kidneys show in the cortex a varying number of grey miliary tubercles with minute opaque centres; in some cases, when the duration of life is short, no tubercles are visible.

The lungs are beset with caseating submiliary tubercles, but seldom to such an extent as after intravenous inoculations: more commonly they collapse partially and contain fairly numerous discrete caseous tubercles. The sternal glands become larger than any other glands in the body and are always caseous throughout; the bronchial glands are enlarged, congested, and contain discrete tubercles; the abdominal lymphatic glands, never much enlarged, show varying amounts of caseation, the extent depending upon the duration of the experiment.

The disease produced by 1·0 mg. of culture inoculated intraperitoneally in many respects resembles that produced by 0·1 mg. inoculated intravenously, and it has repeatedly happened, in a series of rabbits inoculated with a particular culture, that the duration of life in the two cases has been the same.

With smaller doses, 0·1 and 0·01 mg. the distribution of the disease is the same, but the tubercles are usually smaller in number, more caseous, and attain a greater size.

With still smaller doses the disease begins to resemble more and more that produced by subcutaneous inoculation; the tendon of the diaphragm in these cases always shows large flattened caseating nodules, sometimes forming a continuous layer, which project from both surfaces.

Subcutaneous Inoculations.

After subcutaneous inoculation of culture the rabbits have died of tuberculosis in from 38 to 114 days, the average period being 71 days for 1·0 mg. and 86 days for 0·1 mg.

The material has been inoculated in the majority of the cases under the skin of the abdomen, but on several occasions the inoculation has been made into the subcutaneous tissues of the back. The latter plan was adopted to prevent the escape of the bacilli through early ulceration of the lesion. It was discontinued because it was found that when ulceration had taken place other rabbits in the same pen were in the habit of licking the discharges and even of enlarging the ulcer.

The dorsal inoculation always resulted in the formation of a very large lesion which, influenced so much by gravity, often spread and infiltrated the surrounding tissues over a wide area.

The rabbits inoculated in this way succumbed on an average much sooner than rabbits inoculated under the skin of the abdomen; the average period for fourteen of the former inoculated with 1 mg. was 59·25 days, whilst that for thirty-five of the latter was 75·5 days.

When tubercle bacilli are inoculated under the skin of the abdomen a caseous tumour develops, which may attain large dimensions and remain free from ulceration; more commonly the skin becomes adherent, an ulcer forms, and most of the body of the lesion is discharged as caseo-pus.

When the culture is inoculated into the muscular tissues or under the deep fascia the lesion either does not ulcerate or ulcerates late in the disease. In these cases the whole thickness of the muscle wall is involved, and the tuberculous process may extend through the peritoneum and to infect the peritoneal cavity; this, however, rarely happens, and it is surprising how frequently the peritoneum escapes even when the whole thickness of the abdominal wall is infiltrated and caseous.

The glands nearest the local lesion are always enlarged and caseous; if the lesion is near the pubis the inguinal and iliac glands are the most affected, the axillary glands being normal or containing small caseous nodules; if the lesion is situated midway between the axilla and the groin the axillary and inguinal glands become equally affected.

Of the internal organs the lungs are always implicated the most severely; they are voluminous, do not collapse, and are often almost entirely composed of caseating nodules and caseous masses. The rabbits die as a result of this condition; so little functional lung tissue often remains that it is a matter for wonder how the existence of the rabbit during the last few days of life could have been supported.

The lesions in the lungs, in the more chronic cases, may break down and form cavities.

Tubercle bacilli are disseminated very early into the lungs after subcutaneous inoculation, and lesions may be found therein during the third week (opportunity of observing this has been afforded by rabbits which have died prematurely); these lesions were probably caused by bacilli which got into the blood stream direct from the local lesion. In one rabbit, which died 15 days after a subcutaneous inoculation of 0·001 mg. there was one tubercle in the lung and no sign of caseation in the nearest glands.

The spleen in many cases has been found to be normal; it usually contains a varying number of small yellow caseous tubercles. The liver is usually only slightly affected and may be normal.

In a few exceptional cases the spleen and liver have been severely affected; this may have been due to an unusually large number of bacilli getting into the blood stream soon after inoculation; in these cases the spleen was much enlarged and filled with caseating nodules, whilst the liver contained a large number of grey tubercles showing very little caseation.

The kidneys always contain numerous caseating nodules. These may attain a large size and extensively replace the cortical substance. The larger ones project prominently from the surface and on section have a wedge shape. When very large they penetrate into the medullary zone; they rarely, however, produce the long soft caseous streaks, extending from the surface almost to the apex of the papilla, characteristic of the slightly virulent viruses, and collections of caseo-pus are never found in the pelvis.

Lymphatic glands, apart from those adjacent to the local lesion, are never much enlarged, and are often only slightly caseous; this is particularly noteworthy in the case of the bronchial glands.

The vermiform appendix and terminal dilated portion of the ileum frequently contain soft caseous nodules in the sub-mucous tissue, and caseous nodules may be found on the pleura and in the omentum, in the former case sometimes loosely pedunculated.

Calcareous particles have in a few instances been detected in the pulmonary or glandular lesions, and once around the peripheral parts of the local tumour.

The thyroid body has often been found to be tuberculous, containing caseous foci or caseous nodules, which sometimes replace almost the whole of the gland substance.

The Different Methods of Inoculation.

Cultures from each virus have been inoculated in a routine manner intravenously, intraperitoneally, and subcutaneously.

After an intravenous or an intraperitoneal inoculation of culture in a dose of 1·0 mg. or 0·1 mg. the rabbit succumbs in a very short time of an acute generalised tuberculosis. After subcutaneous inoculation, the duration of life is longer and a more chronic disease develops; the disease, however, is progressive and invariably, even after very small doses, causes the death of the animal.

Of the two severe methods of inoculation the intravenous method is in my opinion the better.

Intraperitoneal inoculation is open to several objections; the injection needle may penetrate the wall of the cœcum or the colon, and some part or the whole of the emulsion may be injected into the cavity of the large intestine. In several instances, caseous nodules, ulcerated on the mucous surface, have been found in the wall of the large intestine; in all these cases there was a much smaller number of tubercles on the peritoneum than usual, and the duration of life of the rabbit was abnormally prolonged.

In some cases the size of the lesion found in the subcutaneous tissues or in the muscle wall, and the unusually small number of tubercles on the peritoneum, have left no room for doubt that some of the culture has settled in these tissues, and therefore that the whole of the dose has not entered the peritoneal cavity; this complication is often due to leakage of the emulsion into the subcutaneous tissues after withdrawal of the needle.

The first accident may be avoided by exercising greater care in the inoculation or by using a blunted needle, but it is impossible to prevent the return of some of the emulsion along the track of the needle, and this may occur in such amount as appreciably to affect the duration of life.

These facts make it obvious that it would be unsafe to rely absolutely on the intraperitoneal method in attempting to bring out differences in degree of virulence.

Subcutaneous inoculation under the skin of the abdomen is not entirely satisfactory on account of the frequently early ulceration of the local lesion and the consequent loss of some of the bacilli; it has been pointed out that when bacilli are inoculated subcutaneously in a position whence they cannot escape the severity of the disease is in general greater than when the reverse is the case.

There is the possibility also that bacilli may be inoculated into the peritoneal cavity or into the muscle wall; in the latter case the peritoneum may become affected secondarily by extension of the tuberculous process to that membrane.

Intravenous inoculation is free from all these objections, and when inoculated in suitable doses gives just as certain differentiation between the virulent and slightly virulent viruses as the intraperitoneal or subcutaneous methods.

VIRULENCE.

All the viruses are very virulent for rabbits and capable of setting up in them a fatal general tuberculosis, howsoever inoculated and in whatsoever dose.

An inspection of the lists shows that the duration of life of the rabbits inoculated in the same way with different viruses varies, in some cases very considerably, and the question arises do these differences indicate differences in degree of virulence.

The cultures can, according to their ability to grow on glycerin media, be divided into three classes, and it might be expected that those strains which grow well on glycerin media would be less virulent than those which grow poorly.

In comparing the results with individual viruses many factors, *e.g.*, the age and susceptibility of the animal, the total age of the culture, and the purity of the inoculation, must be taken into consideration.

Age does not appear to have much influence, and quite young animals have often survived longer than old ones inoculated with equivalent doses.

Individual susceptibility exercises a more important influence; frequently where two animals have been inoculated at the same time in the same way the difference in the duration of life has been as great almost as that observed with the different viruses; also on many occasions the animal inoculated with 0·1 mg. has died before the animal inoculated with 1·0 mg. of the same culture.

Prolonged cultivation has very little effect in modifying the virulence of a culture; bacilli in cultivation for periods of over 1,000 days have not been found to be appreciably less virulent than bacilli less than 100 days old.

As mentioned above, the possibility that in intraperitoneal and subcutaneous inoculations some part of the culture may have gone astray must be borne in mind.

These facts show that reliable conclusions, as to whether bacilli which grow well on glycerin media are less virulent than those which grow poorly, can be drawn only by taking fairly large numbers, and so neutralising as far as possible the disturbing factors.

To this end I have taken for comparison four typical representatives of Class I. and four of Class III. and arranged the results in the form of a table. (*See* page 440.)

Each rabbit included in the table has died of uncomplicated tuberculosis so that the duration of life may be taken as a measure of the virulence of the culture for that particular animal.

Analysed in this way, the strains belonging to Class III. are found to be not less, but, if anything, more virulent, than those belonging to Class I.

RABBITS INOCULATED WITH GRADUATED DOSES OF TUBERCLE BACILLI.

Two series of rabbits were inoculated with graduated doses of tubercle bacilli with the object of ascertaining the extent to which a given suspension of culture could be diluted and yet be capable of giving rise to tuberculosis.

In each case an emulsion of culture was prepared so that 1 cubic centimetre was equivalent to 1 milligramme of bacilli; 1 c.c. of this emulsion was diluted to 10 c.c.; 1 c.c. of the latter dilution again to 10 c.c., and so on, until a dilution of the original suspension of 1 in 1,000 million was obtained.

In the first series* a rabbit was inoculated with 1 c.c. of each dilution; all these rabbits died of general tuberculosis.

In the second series some of the lower dilutions were omitted, but all the higher dilutions from one millionth to one thousand millionth part were inoculated.

In this series all the rabbits inoculated with doses up to one ten millionth part of the original suspension developed tuberculosis; the two rabbits inoculated with the two higher dilutions respectively, remained free from tuberculosis.

Both series show conclusively that an extremely small number of tubercle bacilli will give rise to general progressive tuberculosis in the rabbit. It would be impossible to state with any degree of accuracy the smallest number of bacilli which effected this result on account of the property exhibited by the tubercle bacillus of adhering together in clumps and of the improbability that in these emulsions the bacilli were distributed homogeneously.

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* The last four or five dilutions in this series were not made so accurately as in the second series, owing to the fact that for them the same pipette was used.

INTRAVENOUS INOCULATIONS.
DOSE 0·1 Mg.

Classification of Culture.	Virus.	Number of Rabbits Inoculated.	Average Duration of Life.	Combined Average Duration of Life in days.
Class I.	VI.	2	19	20
	XII.	1	24	
	XVII.	1	18	
	XIX.	1	19	
Class III.	V.	3	20·6	19·2
	IX.	1	18	
	X.	1	16	
	XI.	1	18	
	INTRAPERITONEAL INOCULATIONS. DOSE 1·0 Mg.			
Class I	VI.	2	18	21·5
	XII.	3	21·6	
	XVII.	2	23	
	XIX.	2	23	
Class III.	V.	3	18·3	19·7
	IX.	4	22·25	
	X.	1	19	
	XI.	2	17	
	DOSE 0·1 Mg.			
Class I.	VI.	3	27·3	29·1
	XII.	2	29·5	
	XVII.	1	35	
	XXII.	1	28	
Class III.	V.	1	34	27·8
	IX.	1	30	
	X.	1	20	
	XI.	2	27·5	
	SUBCUTANEOUS INOCULATIONS. DOSE 1·0 Mg.			
Class I.	VI.	2	90	73·4
	XII.	2	61	
	XVII.	2	68·5	
	XIX.	1	75	
Class III.	V.	3	83·3	73
	IX.	3	67	
	X.	2	80·5	
	XI.	3	61·6	
	INOCULATED IN THE SUBCUTANEOUS TISSUES OF THE BACK. DOSE 1·0 Mg.			
Class I.	Average duration of life of six rabbits, 68·5 days.			
Class III.	Average duration of life of four rabbits, 54·5 days.			

LIST OF RABBITS INOCULATED WITH EMULSIONS OF TUBERCULOUS TISSUES.

INTRAVENOUS INOCULATIONS.

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Number of c.c. Inoculated.	Number of Tubercle Bacilli.	Duration of Life.	Result.
B I.	Prescapular gland of Calf 122	9	3,200	2,220	4 c.c.	Not estimated	Died, 45 days	Lungs, almost entirely consolidated, packed with grey miliary tubercles, showing very little central caseation. The bronchial glands were enlarged and caseous. The liver and kidneys contained numerous tubercles; the spleen was swollen and beset with yellow foci. The wall of the right ventricle showed about 12 caseating tubercles. The vermiform appendix showed numerous caseous nodules, and there were caseous tubercles in almost all the peripheral lymphatic glands.
B VI.	Prescapular gland of Calf 216	154	1,100	800	1 c.c.	Not known	Died, 36 days	The lungs were partly consolidated and beset with grey caseating tubercles up to 2 mm. in diameter. The spleen and liver contained numerous small tubercles; the kidneys a moderate number of miliary tubercles. The bronchial glands were caseous, other lymphatic glands showing caseous foci.

INTRAPERITONEAL INOCULATIONS.

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Number of c.c. Inoculated.	Number of Tubercle Bacilli.	Duration of Life.	Result.
B I.	Prescapular gland of Calf 126	8	2,400	1,620	10 c.c.	1,000,000	Died, 82 days	Caseous nodule in wall of abdomen; caseation of inguinal and axillary glands. Omentum greatly thickened and extensively caseated; large caseous nodules on the mesentery and one or two on the parietal peritoneum. There were a few tubercles in the spleen and several in the liver and kidneys. The lungs were packed with caseous nodules, tending to become confluent. There were numerous nodules on the pleura and in the intestines, and several in the heart. The abdominal and thoracic lymphatic glands were caseous throughout. The spermatic cords and epididymes were tuberculous.
B II.	Local tumour and prescapular gland of Calf 138	51	2,100	1,400	1 c.c.	1,467,000	Died, 124 days	Numerous caseous nodules and masses in the omentum; scattered nodules on somatic and visceral peritoneum; a few tubercles in the liver and spleen; numerous nodules in the kidneys; lungs extensively tuberculous.
B IV.	Original material.	5	1,050	1,200	1 c.c.	1,014,200	Died, 78 days	Omentum retracted and greatly thickened; there were a few tubercles on the mesentery and serous surfaces of the intestines. The spleen showed a few tubercles on the surface and on section; the liver showed numerous caseating tubercles on the surface and several in the depth; the kidneys contained numerous caseating nodules. The lungs were closely beset with caseating nodules, the cephalic lobes being practically completely solid. The bronchial, mesenteric and lumbar glands were caseous and there were tuberculous growths on the parietal pleura and diaphragm,
B IV.	Milk of Cow 164	80	580	640	5 c.c.	50,000	Died, 46 days	Omentum greatly thickened; moderate number of tubercles on parietal and visceral peritoneum; a few tubercles in the spleen and liver; kidneys and lungs closely beset with caseating nodules. Bronchial glands contained caseous foci; other lymphatic glands contained caseous tubercles. The tendon of the diaphragm showed masses of new-formed tuberculous tissue.

LIST OF RABBITS INOCULATED WITH EMULSIONS OF TUBERCULOUS TISSUES—*continued.*

INTRAPERITONEAL INOCULATIONS—*continued.*

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Number of c.c. Inoculated.	Number of Tubercle Bacilli.	Duration of Life.	RESULT.
B V.	Original material	12	700		1 cc.	1,000,000	Died, 5 days	Death due to injuries.
B IX.	Original material (mediastinal gland)	61	2,650	2,000	4 cc.	Not estimated	Died, 119 days	General tuberculosis : spleen normal ; lungs very large and almost completely caseous.
B IX.	Original material (mesenteric gland)	62	3,400	2,480	4 cc.	Not estimated	Died, 38 days	Great thickening of omentum ; serous surfaces of intestines and parietal peritoneum thickly studded with caseous tubercles ; miliary tubercles in the spleen, liver and kidneys ; lungs semi-solid, packed with caseating tubercles.
B XI.	Original material	66	1,050	900	4 cc.	Not estimated	Died, 57 days	Omentum very greatly thickened and extensively caseated ; peritoneum and mesentery thickly studded with caseous tubercles ; numerous caseous tubercles in spleen, liver and kidneys; lungs packed with caseous confluent nodules ; almost all lymphatic glands tuberculous.
B XII.	Original material	98	800	610	4 cc.	Not estimated	Died, 44 days	Omentum thickened ; moderate number of caseous tubercles on peritoneum and mesentery ; numerous tubercles on the serous surface of the coccum. Miliary tubercles in spleen, liver and kidneys. Lungs closely packed with grey tubercles.
B XIV.	Original material	119	910	720			Died, 11 days	Purulent peritonitis.
B XV.	Original material	139	2,820	2,250	4 cc.	Not known	Died, 52 days	Omentum moderately thickened ; numerous caseating tubercles on the parietal and visceral peritoneum ; the spleen, liver and kidneys showed numerous caseous tubercles ; lungs packed with caseating nodules ; Bronchial and cœliac glands caseous ; tuberculosis of diaphragm.
B XVI.	Original material	155	2,050	1,320		Not estimated	Died, 70 days	Omentum slightly thickened ; sparsely scattered tubercles on the parietal and visceral peritoneum ; numerous tubercles in the spleen and liver ; a few in each kidney ; lungs packed with caseating nodules ; thoracic, portal and mesenteric lymphatic glands caseous.
B I	Original material (Lung).	156	1,500		4·0 cc.	Not estimated.	6 days	Acute infection.
B XVII.	Original material (Mediastinal gland).	157	1,750	1,140	4·0 cc.	Not estimated.	81 days	A few discrete caseous nodules in the omentum and on the parietal and visceral peritoneum. Both kidneys contained fairly numerous caseating nodules ; the lungs were extensively tuberculous, the tissue being practically completely replaced by caseating masses. All lymphatic glands were affected.
B XVIII	Original material (Bronchial gland).	160	2,690	2,200	4·0 cc.	Not estimated.	26 days	Omentum thickened and retracted. Parietal and visceral peritoneum covered with opaque miliary tubercles. Spleen, liver, and kidneys contained a few early tubercles. The lungs were packed with grey miliary tubercles, the cephalic lobes being consolidated. The parietal pleura was covered with minute tubercles. The thoracic, portal and iliac glands showed caseous tubercles.
B XXVI	Original material	380	940	950	4 cc.	Not estimated	Died, 55 days	General tuberculosis ; the lungs contained numerous caseating nodules and there were a few tubercles in the spleen, liver and kidneys.

List of Rabbits Inoculated with Emulsion of Tuberculous Tissues—*continued.*

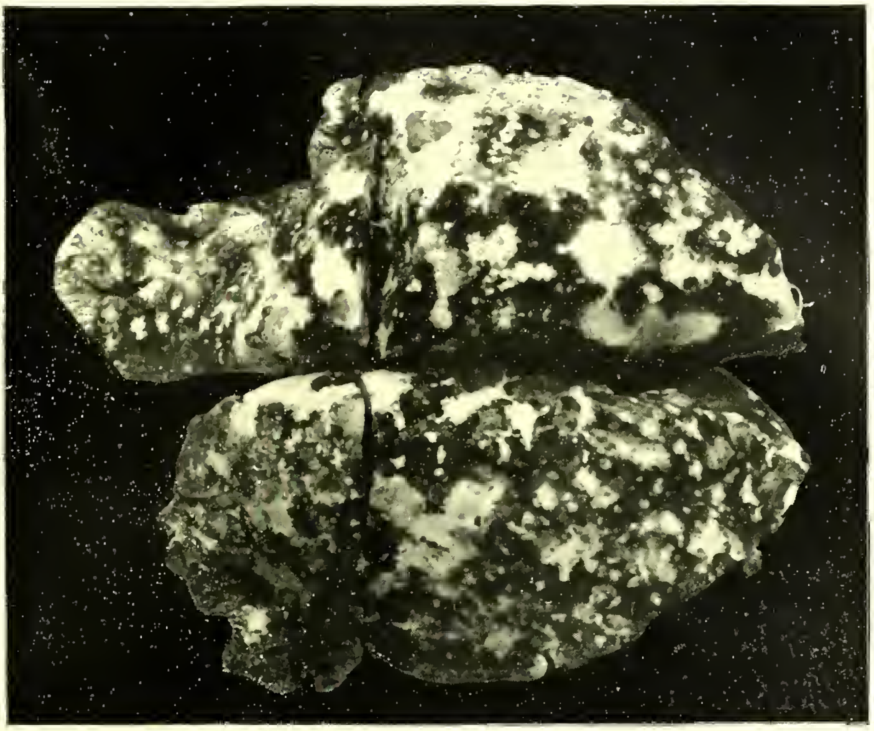
Intraperitoneal Inoculations—*continued.*

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Number of cc. Inoculated.	Number of Tubercle Bacilli.	Duration of Life.	Result.
B XXIX	Original material	755	1,160	950	—	Not estimated	Died, 76 days	In the subcutaneous tissues of the abdomen there was a small flat caseous nodule ; a considerable part of the anterior abdominal wall was composed of thick leathery caseated tissue ; the inguinal and axillary glands were partly caseous ; the omentum was slightly thickened, and composed of translucent caseating tissue. The spleen contained two yellow tubercles, and there were sparsely scattered tubercles in the liver. Each kidney contained a few nodules, up to 4 mm. in diameter. The lungs were enlarged and filled the thorax ; they were closely beset with caseating tubercles ; the bronchial, lumbar, iliac, and mesenteric glands contained discrete tubercles. There was a minute tubercle in the right lobe of the thyroid.
B XXX.	Original material (inguinal gland)	814	—	—	—	Not estimated	Died, 58 days	Caseous patch in muscle wall. Omentum greatly thickened, composed of dense yellow caseated tissue ; there were sparsely scattered caseous tubercles on the parietal peritoneum, and rather numerous tubercles on the mesentery and serous surface of colon. The spleen was closely beset with yellow caseous tubercles ; there were a few doubtful foci in the liver, and numerous caseous nodules in the kidneys. The lungs were enlarged and closely beset with caseating nodules confluent in the anterior lobes and dorsal borders of the caudal lobes. The pleural surface of the diaphragm was covered with an almost continuous layer of yellow caseated tissue ; there were numerous tubercles on the dorsal mediastinal pleura and hypertrophy and caseation of the fringes along the margins of the ribs. Most of the lymphatic glands were tuberculous.
B XXX.	Original material (bronchial gland)	815	—	—	—	Not estimated	Died, 66 days	General tuberculosis, very similar to that in Rabbit 814, but lungs and pleura not so severely affected.

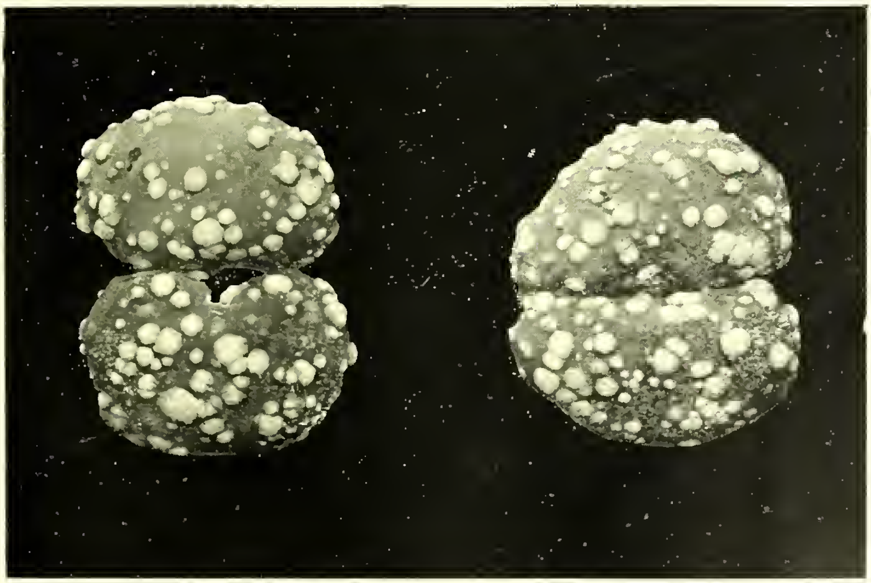
List of Rabbits Inoculated with Emulsion of Tuberculous Tissues—*continued.*

SUBCUTANEOUS INOCULATIONS.

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Number of cc. inoculated.	Number of Tubercle Bacilli.	Duration of Life.	Result.
B I.	Prescapular gland of Calf 126.	7	2,420	1,450	10 cc.	1,000,000	Died, 116 days.	Ulcerated local lesion. Enlarged and caseous inguinal glands. No tubercles seen in liver or spleen. Moderate number of caseous nodules in the kidneys. Lungs extensively tuberculous.
B III.	Original material.	1	3,220	1,770	1 cc.	1,460,000	Killed, 96 days (very ill).	General tuberculosis; numerous nodules in kidneys; lungs severely affected.
B IV.	Original material.	2	990	1,670	1 cc.	1,014,200	Died, 140 days.	Local lesion; neighbouring glands caseous; one or two foci in spleen and liver; numerous nodules in lungs and kidneys.
B IV.	Original material.	3	1,000	1,400	1 cc.	1,014,200	Died, 128 days.	General tuberculosis resembling that in Rabbit 2.
B IV.	Original material.	4	980	1,370	1 cc	1,014,200	Died, 142 days.	Local lesion; neighbouring glands caseous; liver and spleen showed no obvious tubercles; lungs and kidneys crammed with caseating nodules.
B IV.	Local tumour of Prescapular gland of Calf 138.	50	1,900	1,380	1 cc.	1,467,000	Died, 122 days.	Local lesion: neighbouring glands caseous; two or three tubercles in the spleen, and about the same number in the liver. Kidneys packed with nodules. Lungs almost entirely solid, being filled with large caseous masses.
B IV.	Cow 164 (milk).	79	580	1,090	5·0 cc.	50,000	Killed, 109 days (ill).	Local caseous ulcer; neighbouring glands caseous. There was one nodule in the liver; none in the spleen. The cortex of each kidney was packed with nodules. The lung tissue was almost entirely replaced by confluent caseating nodules. There was slight tuberculosis of the pleura and peritoneum and of the intestines. The portal and thoracic glands were caseous. The muscle of the left venticle showed a caseating nodule.
B V.	Original material.	11	630	850	1 cc.	1,000,000	Died, 76 days.	Ulcerated caseous local tumour. Neighbouring glands caseous. The spleen and liver contained a few caseous tubercles. There were numerous nodules in the kidneys, and the lungs were packed with coalescing caseous nodules. All the lymphatic glands were tuberculous. The omentum and peritoneum were affected.
B. IX.	Inguinal gland of Rabbit 347	511	1,060	1,230	—	—	Died, 99 days	In the subcutaneous tissues between the scapulae there was a large firm nodular caseous tumour, adherent to the skin which was not ulcerated. Axillary glands enlarged and caseous. Spleen normal. Liver contained a few caseous nodules. The kidneys were closely beset with caseating nodules, up to a large pea. The lungs filled the chest and were closely beset with caseous masses; the anterior lobes sank in water. All the abdominal and thoracic lymphatic glands were slightly caseous. The omentum contained discrete tubercles and there were a few tubercles on the mesentery and pleura.



RABBIT 50. Inoculated subcutaneously with an emulsion made from the local tumour and prescapular gland of Calf 138 (Virus B. IV.).
Lungs, dorsal surface, showing large caseous areas.



RABBIT 50. Inoculated subcutaneously with an emulsion made from the local tumour and prescapular gland of Calf 138 (Virus B. IV.)
Kidneys, showing the characteristic projecting nodules.

List of Rabbits Inoculated with Emulsion of Tuberculous Tissues—*continued.*

Subcutaneous Inoculations—*continued.*

No. of Virus.	Material obtained from.	Number of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Number of cc. inoculated.	Number of Tubercle Bacilli.	Duration of Life.	Result.
B XI.	Original material.	65	720	820	4·0 cc.	Not known.	Died 76 days.	General tuberculosis; lungs packed with coalescing caseating nodules.
B XIII.	Original material.	116	450	600	—	Not known.	Died 62 days.	Large caseous ulcer. Neighbouring glands caseous. The spleen contained six small yellow tubercles; the liver a number of minute grey-white foci. There were numerous nodules in the kidneys, and the lungs were filled with coalescing caseating nodules. There were a few nodules on the diaphragm, and caseous foci in the mesenteric, portal, and bronchial glands.
B XXIX	Original material (mediastinal gland)	754	1,120	920	Not estimated		Died, 100 days.	In the wall of the abdomen there was a softened caseous tumour the size of a hen's egg; the skin was adherent and showed a small dry ulcer. The adjacent glands were enlarged and caseous The omentum contained numerous miliary tubercles. The lungs were enlarged and solid almost throughout; they were composed of irregular caseating nodules, closely aggregated. The kidneys contained numerous nodules, the largest 4 mm. in diameter. There was one tubercle in the spleen; none was seen in the liver. There was a tubercle in the heart muscle, and there were numerous caseous tubercles in the marrow of the ribs. Most of the lymphatic glands were caseous.

LIST OF RABBITS INOCULATED WITH CULTURES OF TUBERLE BACILLI OF BOVINE ORIGIN.

INTRAVENOUS INOCULATIONS.

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Subculture Inoculated.	Total period under cultivation since isolation.	Duration of Life.*	RESULT.
B I.	Pig 16	159	1,700	1,200	20 days 10th generation	360 days	D. 21 days	Lungs closely beset with caseating miliary tubercles, confluent in the cephalic lobes; caseous tubercles in the bronchial glands; spleen greatly swollen, showed innumerable minute foci in the pulp. Liver substance speckled with minute grey points. Moderately numerous grey tubercles in the cortex of each kidney.
B II.	Calf 134	152	2,190	1,650	20 days 5th generation	227 days	D. 15½ days	Result similar to that in Rabbit 159.
B III.	Calf 214	234	1,820	1,300	20 days 8th generation	147 days	D. 14 days	Ditto
B V.	G.P. 711	145	1,640	1,360	20 days 5th generation	371 days	D. 16 days	Ditto
B VI.	G.P. 1015	179	2,270	1,360	20 days 6th gneration	248 days	D. 20 days	Ditto
B VII.	G.P. 1017	173	2,520	1,870	20 days 6th generation	247 days	D. 15 days	Ditto
B VIII.	Original material	259	810	640	21 days 18th generation	321 days	D. 6 days	No macroscopic lesions of tuberculosis but numerous T.B. found in lung, liver and spleen.
B X.	G.P. 1070	267	2,530	1,980	20 days 13th generation	295 days	D. 10 days	Lungs contained numerous discrete greyish-white tubercles; the liver and spleen (enlarged) showed very minute grey points throughout: No tubercles visible in kidneys. T.B. numerous in liver and spleen, scanty in kidney and an inguinal gland.
B XI.	Rabbit 66	163	2,500	2,070	22 days 7th generation	154 days	D. 13 days	General tuberculosis. Lungs closely beset with discrete miliary tubercles; tubercles very minute in other organs. T.B. numerous in liver and marrow.
B XIV.	Original material	252	890	650	19 days 11th generation	194 days	D. 16 days	Result similar to that in Rabbit 159.
B XXVI.	Original material	899	1,970	1,460	14 days 13th generation	308 days	D. 12 days	The lungs were congested, œdematous and somewhat emphysematous; they contained in the substance numerous minute grey tubercles, some of which were opaque. Mediastinal glands enlarged and œdematous. Spleen enlarged; no tubercles seen in it nor in any of the other organs. Numerous T.B. found in liver.
B XXVIII	Original material	892	1,400	1,050	21 days 6th generation	137 days	D. 11 days	The lungs were firm and did not collapse; they were closely beset with grey submiliary tubercles with caseous centres; the spleen was enlarged and peppered with grey points just visible to the naked eye; there were similar points throughout the substance of the liver; there were a few small tubercles in the kidneys and a few caseous tubercles and nodules in the bronchial and mediastinal glands.
B XXIX.	Original material	905	2,000	1,500	20 days 7th generation	129 days	D. 11 days	General tuberculosis as in Rabbit 892.
B XXX.	Original material	914	2,700	1,960	20 days 4th generation	83 days	D. 12 days	Ditto

* D. signifies that the animal died.

List of Rabbits Inoculated with Culture of Tubercle Bacill of Bovine Origin.

INTRAVENOUS INOCULATIONS.

Dose: 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in grammes	Final Weight in grammes	Age and Generation of Subculture Inoculated.	Total period under cultivation since isolation.	Duration of Life.	Result.
B. I.	Cow 44.	55	2,430	1,800	20 days 3rd generation	177 days	D.19½ days	Lungs pale, semi-solid, packed with miliary tubercles; the bronchial glands were enlarged and contained caseous foci Spleen, greatly swollen, closely beset with minute whitish foci. Liver substance showed innumerable minute grey points. In the cortex of each kidney there were moderately numerous miliary tubercles.
	,,	56	2,150	1,510	,,	,,	D.22 days	
	,,	57	1,900	1,329	,,	,,	D.16 days	As in Rabbit 55.
	,,	81	1,270	1,160	20 days 5th generation	217 days	D.22 days	
	,,	82	1,100	920			D.25 days	
	Cow 40	113	1,500	1,500	21 days 15th generation	591 days	D.21 days	
	,,	114	850				D.5 days	Died of psorospermosis.
	,,	138	1,720	1,600	21 days 18th generation	640 days	D.34 days	Miliary tuberculosis of lungs and kidneys; very numerous small tubercles in liver and spleen.
B. II.	Heifer 66	122	930	770	20 days 9th generation	357 days	D.25 days	General tuberculosis resembling that in Rabbit 55 (Virus I.)
		121	880	670			D.22 days	
	Calf 134	150	1,770	1,650	20 days 5th generation	227 days	D.19 days	
		151	1,890	1,570			D.26 days	
B. III.	Original material	99	1,560	1,700	20 days 7th generation	427 days	D.18 days	
		100	1,800	1,700			D.24 days	
B. IV.	Original material	58	2,300	1,700	20 days 9th generation	316 days	D.16½ days	
		59	2,260	1,640			D.13 days	Lungs packed as closely as possible with grey tubercles; minute foci in the kidneys: liver and spleen (much enlarged) showed no macroscopic tubercles but very numerous T.B. found in smear preparations.
		60	2,010	1,720			D. 7 days	Died after parturition. T.B. numerous in lung, spleen and bone-marrow.
		63	3,390	1,950	20 days 10th generation	319 days	D.27 days	Result similar to that in Rabbit 138. Tubercles in the heart.
		64	3,200	2,400			D.27 days	
		85	1,270	920	20 days 12th generation	356 days	D.24 days	
		86	990	860			D.19 days	
		836	1,820	1,100	21 days 5th generation	1,002 days	D.20 days	
B. V.	G.P. 711	128	1,120	920	20 days 3rd generation	336 days	D.21 days	General tuberculosis resembling that in Rabbit 55 (Virus I.)
		129	1,300	900			D.20 days	
	Heifer 80	214	1,490	1,150	20 days 10th generation	418 days	D.21 days	
B. VI.	G.P. 1014	106	1,160	860	20 days 3rd generation	91 days	D.18 days	
		107	1,160	750			D.20 days	
B. VII.	G.P. 1017	172	2,150	1,850	20 days 6th generation	247 days	D.21 days	
B. VIII.	Original material	258	720	550	21 days 18th generation	321 days	D.11 days	Numerous minute grey tubercles in the lungs; exceedingly numerous minute grey points in liver and spleen, and a few in each kidney.
B. IX.	G.P. 1069	212	1,600	1,120	20 days 11th generation	249 days	D.18 days	General tuberculosis as in Rabbit 55.
B. X.	Original material (through G.P. 1070).	266	2,040	1,820	20 days 13th generation	295 days	D.16 days	Lungs normal in colour, contained not very numerous small caseous tubercles; liver and spleen beset with extremely minute grey foci; (?) a few tubercles in kidneys. T.B. numerous in liver and bone marrow.

List of Rabbits Inoculated with Culture of Tubercle Bacilli of Bovine Origin.

INTRAVENOUS INOCULATIONS.—*continued.*

Dose: 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Subculture Inoculated.	Total period under cultivation since isolation.	Duration of Life.	Result.
B. XI.	Rabbit 66	162	2,820	2,130	22 days 7th generation	154 days	D. 18 days	Result similar to that in Rabbit 55. (Virus B. I.)
B. XII.	Original material	283	1,310	1,020	20 days 12th generation	275 days	D. 24 days	
B. XIII.	Rabbit 116.	279	1,720	1,020	20 days 12th generation	217 days	D. 20 days	
B. XIV.	Original material	248	880	700	19 days 11th generation	194 days	D. 21 days	
B. XV.	Original material	284	1,340	1,050	21 days 9th generation	169 days	D. 19 days	
B. XVI.	Original material	296	2,220	1,700	21 days 8th generation	143 days	D. 24 days	
B. XVII.	Original material	260	1,770	1,420	20 days 6th generation	94 days	D. 18 days	
B. XIX.	Original material	361	960	720	20 days 8th generation	113 days	D. 19 days	The lungs were closely beset with grey miliary tubercles with opaque centres. The spleen was much enlarged and closely beset with minute greyish white tubercles. The liver showed numerous similar but smaller foci. There were scattered grey tubercles in each kidney, some with opaque centres. The bronchial, portal and iliac glands contained caseous foci.
B. XX.	Original material	378	1,020	750	20 days 7th generation	115 days	D. 19 days	General tuberculosis, very similar to that in Rabbit 361.
B. XXI.	Original material	354	1,700	1,130	18 days 6th generation	91 days	D. 18 days	
B. XXII.	Original material (through G.P. 1509)	419	1,250	940	20 days 6th generation	109 days	D. 22 days	General tuberculosis: lungs closely beset with miliary tubercles causing complete consolidation of the anterior lobes: liver and spleen beset with minute tubercles; numerous grey tubercles with opaque centres in each kidney. The bronchial, portal, and coeliac glands showed caseous tubercles in the cortex; the inguinal and axillary glands caseous foci.
B. XXIII.	Original material	384	1,420	1,240	20 days 6th generation	110 days	D. 19 days	General tuberculosis similar to that in Rabbit 361: numerous minute tubercles on the endocardium and under the pericardium of the right ventricle.
B. XXIV.	Original material	392	1,190	1,000	20 days 6th generation	110 days	D. 18 days	General tuberculosis similar to that in Rabbit 361 (Virus B. XIX.).
B. XXV.	Original material	433	1,170	900	20 days 4th generation	76 days	D. 22 days	
B. XXVI.	Original material	517	1,480	1,200	20 days 6th generation	111 days	D. 19 days	
B. XXVII.	Original material (Diaphragm)	501	1,550	1,170	21 days 4th generation	56 days	D. 20 days	
B. XXVIII	Original material	893	1,250	950	21 days 6th generation	157 days	D. 12 days	Numerous small grey tubercles in the lungs; spleen enlarged, contained numerous minute grey points; there were numerous minute grey points in the liver, and also numerous psorosperm nodules; there were a few tubercles in the kidneys, and a few caseous foci in the bronchial glands.
B. XXIX.	Original material	906	1,920	1,310	20 days 7th generation	129 days	D. 12 days	General tuberculosis, similar to that in Rabbit 893.
B. XXX.	Original material	915	2,170	1,320	20 days 4th generation	83 days	D. 15 days	General tuberculosis of the usual type.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN.

INTRAPERITONEAL INOCULATIONS.

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under Cultivation since Isolation.	Duration of Life.*	RESULT.
B. I.	Cow 40	137	1,140	1,050	21 days 18th generation	640 days	D.31 days	Omentum greatly thickened, retracted and caseating. Parietal and visceral peritoneum profusely covered with small caseous tubercles. Spleen and kidneys beset with miliary tubercles; liver substance speckled with minute grey points. Lungs very closely beset with opaque miliary tubercles, the cephalic lobes being quite solid. Most of the lymphatic glands showed caseous tubercles.
	Pig 16	158	1,000	1,070	20 days 10th generation	360 days	D.62 days	General tuberculosis. The inoculation was partly subcutaneous.
B. II.	Heifer 66	120	850	720	20 days 9th generation	357 days	D.18 days	Omentum thickened, retracted and advanced in caseation. Parietal and visceral peritoneum profusely covered with minute grey tubercles, most numerous on the mesentery meso-colon, and diaphragm. Spleen swollen, beset with minute opaque points. Liver infiltrated with grey foci. Both kidneys showed in the cortex a small number of grey tubercles. The lungs contained moderately numerous miliary caseating tubercles. The bronchial glands were enlarged and caseating; the portal and lumbar glands showed caseous foci.
	Calf 134	148	2,790	2,000	20 days 5th generation	227 days	D.17 days	Result similar to that in Rabbit 120.
		149	990	900			D.16 days	
B. III.	Calf 214	235	1,790	1,120	20 days 8th generation	147 days	D.21 days	Ditto.
		236	590	470			D.13 days	As in Rabbit 120, but tubercles much smaller in size.
	Original material	134	1,150	900	20 days 16th generation	420 days	D.14 days	
		205	3,170	2,050	20 days 22nd generation	575 days	D.21 days	Result similar to that in Rabbit 120.
B. V.	G.P. 711	143	1,740	1,200	20 days 5th generation	371 days	D.22 days	General tuberculosis.
		144	1,700	1,320			D.18 days	
	Original material	131	1,010	820	21 days 3rd generation	154 days	D.15 days	As in Rabbit 134.
B. VI.	Original material (through G.P. 1015)	180	2,900	1,700	20 days 6th generation	248 days	D.61 days	In the subcutaneous tissues of the abdominal wall there was a large softened caseous tumour, with fibrous walls. The omentum was greatly thickened and composed of dense fibro-caseous masses. The parietal and visceral peritoneum showed fairly numerous discrete caseous nodules ranging in size from a millet seed to a wheat grain. The spleen and liver contained a few yellowish tubercles. The kidneys contained fairly numerous caseating nodules. The lungs were large and filled with yellow caseous masses. All the lymphatic glands were affected, and there were caseous nodules in the wall of the intestine.
		181	2,500	1,840			D.19 days	General tuberculosis similar to that in Rabbit 190.
		413	1,600	1,340	20 days 14th generation	446 days	D.15 days	Omentum thickened and in a state of early caseation; numerous minute tubercles on parietal and visceral peritoneum; small masses of gelatinous material in peritoneal cavity; spleen enlarged, no tubercles seen; numerous extremely minute grey foci in liver: the kidneys showed fairly numerous, the lungs very numerous minute grey tubercles Thoracic and portal gland. showed early caseation.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

INTRAPERITONEAL INOCULATIONS—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under Cultivation since Isolation.	Duration of Life.	RESULT.
B. VI. *cont.*	Original material (through G.P. 1015)	415	1,290	1,080	20 days 14th generation	446 days	D.21 days	General tuberculosis: spleen enlarged, but no tubercles visible. Numerous minute tubercles in liver, kidneys, and lungs.
B. VII.	G.P. 1017	175	2,250	1,600	20 days 6th generation	247 days	D.17 days	General tuberculosis resembling that in Rabbit 120. (Virus B. II.).
		176	2,530	1,630			D.19 days	
	Original material	228	1,170	920	20 days 8th generation	301 days	D.98 days	Small ulcerated cavity in wall of abdomen, containing caseo pus: left inguinal gland caseous throughout. Omentum thickened, composed of parasitic cysts and creamy yellow caseated tissue. Fairly numerous yellow tubercles on parietal peritoneum, mesentery and meso-colon, and scattered caseous nodules on surface of intestines. In wall of cœcum were several groups of nodules ulcerated on the mucous surface. The kidneys were closely beset with caseating nodules. The spleen showed a few tubercles on the surface and two or three in the pulp; the liver a few tubercles on the surface and one caseous gritty nodule in the pulp. The lungs were beset with caseating nodules and tubercles: in two lobes were small cavities. The axillary, portal, mesenteric, and thoracic lymphatic glands were tuberculous.
B. VIII.	Original material	253	3,370	2,270	21 days 18th generation	321 days	D.20 days	Result as in Rabbit 120 (Virus B. II.). Tubercles very numerous on peritoneum.
		256	830	690			D.16 days	As above, but tubercles more minute.
B. IX.	Original material	206	3,420	2,160	20 days 12th generation	260 days	D.24 days	Miliary tuberculosis of peritoneum and lungs: extremely minute grey specks in liver and spleen; kidneys mottled, no definite tubercles seen.
		207	2,470	1,580			D.22 days	
		306	1,800	1,120	21 days 15th generation	347 days	D.27 days	Omentum thickened; parietal and visceral peritoneum profusely covered with minute grey tubercles. Spleen slightly enlarged, ? minute grey points in the pulp. Liver showed extremely numerous minute grey specks; kidneys very numerous grey tubercles; lungs packed with caseating tubercles; thoracic glands caseous in the cortex. Microscopical: numerous T.B. in spleen.
		348	2,130	1,380	21 days 17th generation	385 days	D.16 days	General tuberculosis: tubercles very numerous in all organs; extremely minute in liver and spleen.
B. X	Original material (through G.P. 1070)	270	2,190	1,850	20 days 13th generation	295 days	D.19 days	Numerous tubercles on parietal and visceral peritoneum; spleen large, beset with grey foci; similar grey foci in liver; sparsely scattered tubercles in lungs. Kidneys not obviously affected.
		272	680	620			D.38 days	General tuberculosis: omentum thickened and caseating, but parietal and visceral peritoneum only slightly affected; ? inoculation not all intraperitoneal; a few miliary tubercles in spleen, liver and kidneys; lungs extensively caseated.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

INTRAPERITONEAL INOCULATIONS—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Subculture Inoculated.	Total period under Cultivation since Isolation.	Duration of Life.	RESULT.
B. XI.	Rabbit 66	186	2,040	1,520	19 days 7th generation	64 days	D. 17 days	General tuberculosis (similar to that in Rabbit 120, page 449).
		187	1,870	1,470			D. 17 days	
B. XII.	Rabbit 98	231	1,230	890	20 days 9th generation	193 days	D. 25 days	
	Original material	281	590	520	20 days 12th generation	275 days	D. 18 days	
		282	1,260	940			D. 22 days	
B. XIII.	Original material (through Rabbit 116	274	690	580	20 days 12th generation	217 days	D. 11 days	Omentum slightly thickened; extremely minute grey tubercles on parietal and visceral peritoneum and in lungs; none definitely seen in other organs.
		276	1,890	1,320			D. 13 days	Very minute tubercles on the peritoneum and in all the organs.
B. XIV.	Original material	245	3,230	2,020	19 days 11th generation	194 days	D. 19 days	General tuberculosis resembling that produced in Rabbit 120.
		249	800	600			D. 18 days	
B. XV.	Original material	288	1,370	850	21 days 9th generation	169 days	D. 13 days	Omentum and peritoneum normal to the naked eye; minute tubercles in all organs (resembled an intravenous inoculation.)
		289	1,630	1,050	21 days 9th generation	170 days	D. 65 days	Caseous nodule in abdominal muscle; inguinal glands partly caseous; omentum thickened and caseating; six caseous tubercles on the parietal peritoneum and a few on the visceral. There were yellow tubercles in the spleen and numerous opaque grey tubercles in the liver. Lungs packed with confluent caseating tuberculous masses. Most of the lymphatic glands showed areas of caseation; the sternal glands were caseous throughout.
B. XVI.	Original material	299	1,100	800	21 days 8th generation	143 days	D. 26 days	General tuberculosis; tubercles very numerous on the peritoneum and in all organs. Almost all the lymphatic glands were affected.
		300	1,100	900			D. 74 days	Caseous nodule in abdominal wall. Omentum slightly thickened. There were sparsely scattered tubercles on the parietal and visceral peritoneum. The spleen showed 12 yellow tubercles; the liver one opaque nodule. There were about 20 caseating nodules in each kidney. The lungs were closely beset with caseating nodules. Most of the lymphatic glands were tuberculous.
B. XVII.	Original material	262	1,400	860	20 days 6th generation	94 days	D. 19 days	General tuberculosis; tubercles very numerous on the peritoneum (parietal and visceral) and in all the organs.
		263	730	660			D. 27 days	

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued*.

INTRAPERITONEAL INOCULATIONS.—*continued*.

Dose in each case: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under cultivation since Isolation.	Duration of Life.	POST-MORTEM RESULTS.
B. XVIII.	Original material	343	1,230	990	21 days 8th generation	147 days	D. 12 days	Minute grey tubercles just visible on mesentery, meso-colour, and intestines; liver speckled with minute grey points; spleen enlarged, no tubercles seen; a few minute grey tubercles in the kidneys; very numerous tubercles in the lungs; bronchial and sternal glands showed early caseation. Microscopical; T. B. numerous in liver, spleen, and lung.
B. XIX.	Original material	359	2,050	1,420	20 days 8th generation	113 days	D. 19 days	General tuberculosis; the spleen was much enlarged, but no tubercles were seen; in the other organs and on the peritoneum tubercles were very numerous.
		473	1,350	1,090	20 days 13th generation	182 days	D. 27 days	General tuberculosis; tubercles were very numerous in all organs; the anterior lobes of the lungs were consolidated; on the parietal peritoneum the tubercles were less numerous than usual.
B. XX	Original material	375	1,620	1,300	20 days 7th generation	115 days	D. 15 days	Omentum slightly thickened; numerous minute grey tubercles on the visceral peritoneum; similar tubercles on the parietal peritoneum, visible only in the lumbar regions and on the diaphragm; numerous minute grey points in the spleen (enlarged) and liver; no tubercles visible in the kidneys; lungs packed with minute grey tubercles; sternal glands completely caseous, bronchial partly; lumbar and iliac glands caseous in the cortex.
		376	1,270	850			D. 14 days	General tuberculosis very similar to that in Rabbit 375 (*see above*); in this animal, however, tubercles were just visible all over the parietal peritoneum and in the kidneys.
B. XXI.	Original material	353	1,760	1,170	18 days 6th generation	91 days	D. 27 days	General tuberculosis closely resembling that in Rabbit 306 (page 450, Virus IX.).
B. XXII.	Original material (through G.P. 1509).	422	1,190	780	20 days 6th generation	109 days	D. 21 days	General tuberculosis; omentum thickened, caseating and adherent to liver; from the under-surface of the liver a band of caseating tissue extended to the brim of the pelvis; this was adherent to the large intestine; there were numerous tubercles on the parietal and visceral peritoneum, confluent on the meso-colon. No tubercles were seen in the liver and spleen. There were about half-a-dozen tubercles in each kidney. The lungs contained numerous miliary caseous tubercles. Many lymphatic glands were tuberculous.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

INTRAPERITONEAL INOCULATIONS—*continued.*

Dose in each case: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total Period under cultivation since Isolation.	Duration of Life.	POST-MORTEM RESULTS.
B. XXII. *cont.*	Original material (through G.P. 1509).	417	2,000	1,320	20 days 6th generation	109 days	D. 101 days	Caseous nodule in subcutaneous tissues and caseous patch in muscle wall. Omentum not thickened, contained one caseous nodule size of split pea and a few small yellowish-white tubercles. There were a few caseous tubercles on the mesentery, serous surface of colon and parietal peritoneum near left kidney. In the wall of the cæcum there was a prominent disc-shaped caseous nodule, 1·5 cm. in diameter, showing on the mucous surface a deep crateriform ulcer with raised thickened margins. Liver and spleen normal on section. Kidneys very closely beset with caseating nodules. Lungs enlarged and heavy, tissue extensively replaced by caseating nodules and irregular caseous masses. Bronchial portal, and cœliac glands contained caseous foci; the left iliac and mesenteric glands showed patches of caseation; several colic glands were caseous throughout.
B. XXIII.	Original material	382	2,570	2,110	20 days 6th generation	110 days	D. 12 days	Omentum slightly thickened; extremely minute grey points on parietal and visceral peritoneum. Spleen enlarged; no tubercles seen. Liver showed numerous minute grey points. There were some doubtful congested foci in the kidneys and numerous barely visible grey points in the lungs. Lymphatic glands appeared normal. Microscopical: numerous T.B. in liver and spleen, a small number in the lung, none in the kidneys.
B. XXIV.	Original material	388	2,620	1,770	20 days 6th generation	110 days	D. 18 days	General tuberculosis; tubercles very numerous on the peritoneum and in all organs; many lymphatic glands affected.
B. XXV.	Original material	430	1,830	1,400	20 days 4th generation	70 days	D. 24 days	General tuberculosis; tubercles very numerous on the peritoneum and in all organs; caseous foci in mesenteric, iliac, and bronchial glands; sternal glands caseous throughout.
B. XXVI.	Original material	515	2,700	1,820	20 days 6th generation	111 days	D. 22 days	General tuberculosis of the usual type.
		900	1,550	1,020	14 days 13th generation	308 days	D. 18 days	
B. XXVII.	Original material	499	2,290	1,670	21 days 4th generation	56 days	D. 21 days	
		500	1,400	970			D. 18 days	

List of Rabbits Inoculated with Culture of Tubercle Bacilli of Bovine Origin—*continued.*

Intraperitoneal Inoculations—*continued.*

Dose in each case: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total Period under cultivation since Isolation.	Duration of Life.	Post-mortem Results.
B. XXVIII	Original material	894	1,430	1,050	21 days 6th generation	137 days	D. 12 days	General tuberculosis; there were numerous extremely minute tubercles on the peritoneum and in all the organs.
B. XXIX.	Original material	908	1 650	1,180	20 days 7th generation	129 days	D. 50 days	There was a small caseous nodule in the subcutaneous tissues and a large caseous mass in the muscle wall of the abdomen; the omentum was moderately thickened and there were only few tubercles on the peritoneum; the spleen and kidneys contained numerous tubercles and the lungs were packed with coalescing caseating nodules.
B. XXX.	Original material	916	2,650	2,250	20 days 4th generation	83 days	D. 63 days	General tuberculosis; there was a caseous nodule in the wall of the cœcum, ulcerated on the mucous surface (inoculation therefore partly intracœcal).

List of Rabbits Inoculated with Culture of Tubercle Bacilli of Bovine Origin—*continued.*

Intraperitoneal Inoculations—*continued.*

Dose: 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Subculture Inoculated.	Total period under Cultivation since Isolation.	Duration of Life.	Post-mortem Results.
B. I.	Cow 40	112	1,070	840	21 days 15th generation	591 days	D. 31 days	Omentum retracted, thickened and caseating. Numerous tubercles on the serous surface of the large intestine, on the mesentery and mesocolon and on the peritoneal surface of the diaphragm, less numerous on the parietal peritoneum and serous surfaces of the small intestine, liver and spleen. The liver substance showed numerous grey foci. There were numerous caseous tubercles in the spleen pulp and in the cortex of each kidney. The lungs were packed with caseating miliary tubercles, the cephalic lobes being solid. All the lymphatic glands in the body showed caseous nodules or foci.
B. III.	Original Material.	105	650	620	18 days 8th generation	455 days	D. 25 days	Result as in Rabbit 112.
B. IV.	Original material.	117	950	1,000	20 days 14th generation	409 days	D. 40 days	Result similar to that in Rabbit 112, but visceral and parietal peritoneum more severely affected.
		196	580	520	30 days 22nd generation	575 days	D. 15 days	Omentum retracted and slightly thickened; the parietal peritoneum showed a few very minute foci; there were fairly numerous minute tubercles on the mesentery and large intestine; the spleen and liver showed numerous minute grey points; there were a few early tubercles in the lungs and in each kidney. Microscopical: T.B. numerous in liver, spleen and lungs.
B, IV	Original Material.	837	1,770	1,030	20 days 15th generation	1,002 days	D. 24 days	General tuberculosis
B. V.	Heifer 80.	215	1,050	1,040	20 days 10th generation	418 days	D. 34 days	As in Rabbit 112.
B. VI.	G.P. 1014.	110	1,170	850	20 days 3rd generation	91 days	D. 17 days	General tuberculosis: tubercles on parietal and visceral peritoneum very minute.
		416	1,370	1,160	20 days 14th generation	446 days	D. 29 days	General tuberculosis: tubercles numerous on peritoneum, in liver and lungs, not so numerous in spleen and kidneys.
		414	1,500	1,050			D. 36 days	General tuberculosis.
B VII.	G.P. 1017.	174	1,960	1,630	20 days 6th generation	247 days	D. 81 days	Omentum not thickened contained a few pin-head sized tubercles: lungs and kidneys, severely tuberculous: spleen normal: liver? a few tubercles: disc like caseating nodule 1 cm. in diameter in wall of coecum ulcerated on the mucous surface (? inoculation into cavity of large intestine).
	Original material.	227	900	790	20 days 8th generation	306 days	D. 14 days	Omentum slightly thickened fairly numerous tubercles on parietal and visceral peritoneum: caseous focus in a portal gland: no visible lesions in large organs, but T.B. found in lungs, liver and spleen.

List of Rabbits Inoculated with Culture of Tubercle Bacilli of Bovine Origin—*continued.*

Intraperitoneal Inoculations—*continued.*

Dose: 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Subculture Inoculated.	Total period under Cultivation since Isolation	Duration of Life.	Post mortem Results.
B. VIII.	Original material.	255	580	520	21 days 18th generation	321 days	D. 21 days	A few minute tubercles on the parietal and visceral peritoneum; very numerous still smaller points on the mesentery, meso-colon and diaphragm; liver and spleen infiltrated with minute grey foci; fairly numerous tubercles in the kidneys; numerous small tubercles in the lungs which showed patches of collapse; sternal glands caseous.
B. IX.	G.P. 1069.	211	1,280	1,050	20 days 11th generation	249 days	D. 30 days	General tuberculosis as in Rabbit 112 (page 455).
B. X.	Original material (through G.P. 1070).	268	2,150	1,400	20 days 13th generation	295 days	D. 20 days	General Tuberculosis: tubercles numerous on peritoneum, in spleen, liver and lungs, sparsely scattered in the kidneys.
B. XI.	Rabbit 66 (original material).	184	2,790	1,850	20 days 7th generation	164 days	D. 28 days	Omentum thickened and caseating. Parietal and visceral peritoneum profusely covered with little whitish tubercles. Miliary tuberculosis of liver, spleen, kidneys and lungs; lungs partly consolidated. Ventral mediastinal glands caseous throughout. Caseous foci in bronchial, portal, lumbar and iliac glands. Slight tuberculosis of pleura.
		185	2,170	1,660			D. 27 days	
B. XII.	Rabbit 98.	230	910	920	20 days 9th generation	193 days	D. 40 days	As in Rabbit 112, but tubercles not so numerous in spleen.
	Original material.	280	780	570	20 days 12th generation	275 days	D. 19 days	General tuberculosis as in Rabbit 255 (Virus B VIII.).
B. XIII.	Original material (through Rabbit 116).	278	1,480	1,030	20 days 12th generation	217 days	D. 38 days	General Tuberculosis: omentum very thickened; tubercles very numerous on peritoneum, in spleen, kidneys and lungs: in liver there were a few doubtful grey points. Microscopical: numerous T.B. in liver.
B. XIV.	Original material.	247	850	730	19 days 11th generation	194 days	D. 27 days	Omentum retracted. Sparsely scattered tubercles on parietal peritoneum; more numerous on large intestine, mesentery and diaphragm. Lungs packed with miliary tubercles; numerous grey tubercles in kidneys and very numerous grey foci in liver and spleen (enlarged).
		250	810	800			D. 38 days	
B. XV.	Original material.	285	1,280	910	21 days – 9th generation	169 days	D. 109 days.	Caseous ulcer in abdominal wall, nearest glands caseous. Omentum contained a few discrete tubercles. Spleen and liver normal. There were numerous nodules in each kidney. The lungs were enlarged and almost entirely composed of masses of caseating tuberculous tissue; many lymphatic glands affected.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

INTRAPERITONEAL INOCULATIONS.—*continued.*

Dose 0·1 Milligramme.

No. of Virus.	Source of Culture.	Number of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Subculture Inoculated.	Total period under Cultivation.	Duration of Life.	POST-MORTEM RESULTS.
B. XVI.	Original material.	295	1,990	1,550	21 days 8th generation	143 days	D.27 days	Omentum thickened and caseous. Scattered greyish white tubercles on parietal peritoneum, more numerous on mesentery, mesocolon and colon. There were a few tubercles in the spleen and kidneys; numerous tubercles in the liver and lungs. Most of the lymphatic glands were tuberculous.
B. XVII.	Original material.	261	1,530	1,070	20 days 6th generation	94 days	D.35 days	General tuberculosis: tubercles very numerous on peritoneum and in all organs.
B. XVIII.	Original material.	344	1080	920	21 days 8th generation	147 days	D.26 days	General tuberculosis; numerous tubercles on peritoneum and in all the organs; many lymphatic glands affected.
B. XIX.	Original material.	474	1200	940	20 days 13th generation	182 days	D.65 days	General tuberculosis, inoculation partly subcutaneous.
B. XX.	Original material.	377	1370	1160	20 days 7th generation	115 days	D.21 days	General tuberculosis; minute grey tubercles on parietal and visceral peritoneum, in spleen and liver; a few minute grey tubercles in each kidney; lungs contained a moderate number of grey tubercles with caseous centres. Caseous foci in superficial lymphatic glands, lumbar, iliac, mesenteric, portal and bronchial; sternal glands partly caseous.
B. XXI.	Original material.	355	1570	1030	18 days 6th generation	91 days	D.21 days	General tuberculosis; tubercles very numerous on peritoneum, in spleen (enlarged), liver and lungs, not so numerous in kidneys; most of the lymphatic glands were affected.
B XXII.	Original material. (through G.P. 1509).	420	1350	1100	20 days 6th generation	109 days	D.28 days	General tuberculosis; omentum considerably thickened; numerous tubercles on parietal and visceral peritoneum, in liver and lungs; the spleen appeared normal; the kidneys contained a few small opaque tubercles; all the deep lymphatic glands were affected, the sternal glands being caseous throughout.
B XXIII.	Original material.	386	1170	850	20 days 6th generation	110 days	D.28 days	General tuberculosis; tubercles everywhere very numerous, except in the spleen which contained one tubercle only; in the lungs the tubercles had caused complete consolidation of the anterior lobes.
B. XXIV.	Original material.	390	1740	1300	20 days 6th generation	110 days	D.31 days	General tuberculosis; tubercles numerous in all organs with the exception of the spleen: this was enlarged and no tubercles were visible.
B. XXV.	Original material.	432	1220	950	20 days 4th generation	71 days	D.23 days	General tuberculosis; tubercles not so numerous on parietal peritoneum.
B. XXVI.	Original material.	504	1550	1260	20 days 4th generation	56 days	D.27 days	General tuberculosis of the usual type.

INTRAPERITONEAL INOCULATIONS—*continued.*

Dose 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Subculture Inoculated.	Total period under Cultivation.	Duration of Life.	POST-MORTEM RESULTS.
B. XXVIII.	Original Material.	895	1,350	950	21 days 6th generation	137 days	D. 16 days	Omentum thickened and caseating; there were numerous minute tubercles on the colon and mesentery and a small number on the parietal peritoneum; there were moderately numerous minute grey points in the spleen (slightly enlarged) and liver, and an occasional minute tubercle in the kidneys; the lungs were crepitant and contained only sparsely scattered tubercles; the sternal glands were advanced in caseation.
B. XXIX.	Original Material.	907	1,370	900	20 days 7th generation	129 days	D. 23 days	Omentum moderately thick, advanced in caseation; parietal and visceral peritoneum closely covered with minute grey tubercles, moderately numerous grey foci in the liver and a few in the spleen. The kidneys contained sparsely scattered opaque miliary tubercles; the lungs were packed with caseating tubercles. The ventral mediastinal glands were enlarged and caseous and most of the other lympatic glands showed caseous foci.
B. XXX.	Original Material.	917	1,150	–	20 days 4th generaion	83 days	D. 6 days	Coccidiosis of the liver.

INTRAPERITONEAL INOCULATIONS WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN.

Dose in each case: 0·01 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Subculture Inoculated.	Total period under Cultivation.	Duration of Life.	POST-MORTEM RESULTS.
B. XVIII.	Original Material.	342	440	450	21 days 8th generation.	147 days	D. 25 days	General tuberculosis; omentum slightly thickened; a few minute tubercles on the parietal peritoneum, fairly numerous on the visceral; liver and spleen (enlarged) closely beset with minute grey foci; a few grey tubercles just visible in the kidneys; numerous miliary caseating tubercles in the lungs; abdominal and thoracic lymphatic glands tuberculous.
		337	470	390			D. 26 days	General tuberculosis as in Rabbit 342, tubercles rather more numerous in the kidneys.
B. XIX.	Original Material.	363	610	520	20 days 8th generation.	113 days	D. 9 days	Liver filled with psorosperm nodules. Microscopical: numerous T.B. in a sternal gland, a few in the spleen and kidney.
		476	1,150	920	20 days 13th generation.	182 days	D. 7 days	Numerous psorosperm nodules in the liver.
B. XXI.	Original Material.	357	760	620	18 days 6th generation.	91 days	D. 12 days	Psorospermosis of liver; lungs congested in patches; omentum slightly thickened. Microscopical: A few T.B. in lung and liver, numerous in the spleen.
B. XXII.	Original Material (through G.P. 1509).	423	1,040	870	20 days 6th generation.	109 days	D. 27 days	General tuberculosis; omentum moderately thickened; sparsely scattered tubercles on the parietal peritoneum, rather more numerous on the visceral; a few minute tubercles in the spleen, liver and kidneys; moderately numerous opaque miliary tubercles in the lungs; caseous foci in abdominal and thoracic lymphatic glands.
B. XXIII.	Original Material.	387	1,150	1,150	20 days 6th generation.	110 days	D. 42 days	General tuberculosis: omentum thickened and caseating; sparsely scattered tubercles on parietal peritoneum, rather more numerous on mesentery and meso-colon, moderately numerous tubercles in spleen (enlarged), liver and kidneys; lungs closely beset with confluent caseating tubercles, the small anterior lobes being quite solid; almost all lymphatic glands were tuberculous.
B. XXIV.	Original Material.	393	1,100	1,000	20 days 6th generation.	110 days	D. 33 days	General tuberculosis: tubercles numerous in the lungs, less numerous in the other organs; sparsely scattered on the parietal and visceral peritoneum; abdominal and thoracic lymphatic glands tuberculous.
B. XXV.	Original Material.	435	1,170	1,050	20 days 4th generation.	71 days	D. 45 days	General tuberculosis: tubercles sparsely scattered on the parietal and visceral peritoneum, and in the kidneys; very numerous in the spleen (enlarged), liver and lungs; all lymphatic glands were affected.
B. XXVI.	Original Material	516	1,350	1,010	20 days 4th generation.	111 days	D. 30 days	General tuberculosis: tubercles numerous in all the organs and fairly numerous on the peritoneum.
B. XXVII.	Original Material (Diaphragm)	502	1,410	970	21 days 6th generation.	56 days	D. 65 days	General tuberculosis: omentum moderately thickened, partly caseous; numerous grey caseating tubercles on the parietal and visceral peritoneum; there was a moderate number of tubercles in the liver, spleen, and kidneys; the lungs contained fairly numerous irregular caseous masses; the bronchial and iliac glands showed caseous foci, the sternal glands were caseous throughout; other lymph-

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN.

SUBCUTANEOUS INOCULATIONS.

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under cultivation since isolation.	Duration of Life.*	Result.
B. I.	Cow 40	136	1,520	1,350	20 days 18th generation	640 days	D. 82 days	Ulcerated caseous local lesion; adjacent glands caseous; one tubercle in the spleen; none in the liver; numerous caseating nodules in the kidneys; lungs contained moderately numerous caseous nodules of various sizes; caseous foci in the appendix and lower end of ileum (T.B.)
B. II.	Heifer 66	125	810	700	20 days 9th generation	357 days	D. 25 days	General tuberculosis. Omentum thickened and caseating.
	Calf 134	146	1,820	1,700	20 days 5th generation	227 days	D. 81 days	Caseous ulcer: neighbouring glands caseous; the spleen showed one tubercle on the surface and six in the pulp; one caseous nodule in the liver; numerous projecting nodules in the kidneys; lungs very heavy, filled with large solid caseous masses; slight tuberculosis of pleura and diaphragm; many lymphatic glands affected.
		147	1,650	1,450	,,	,,	D. 91 days	General tuberculosis resembling that in Rabbit 146.
B. III.	Calf 214	237	1,370	1,090	20 days 8th generation	147 days	D. 56 days	General tuberculosis; the lungs in both cases were enlarged, extensively consolidated and advanced in caseation.
		238	680	770			D. 63 days	
	Original material	133	1.420	1,220	20 days 16th generation	459 days	D. 112 days	General tuberculosis lungs severely affected, being almost entirely composed of caseating nodules.
B. IV.	Chimpanzee 4	170	2,250	1,550	19 days 3rd generation	46 days	D. 74 days	General tuberculosis.
		171	2,000	1,640			D. 94 days	
	Chimpanzee 6	241	1,260	1,070	21 days 3rd generation	49 days	D. 77 days	Large caseous abscess between shoulder blades: general tuberculosis.
		243	730	910	,,	,,	D. 62 days	Local caseous ulcer: general tuberculosis.
	Chimpanzee 8	322	1,030	860	20 days 6th generation	84 days	D. 53 days	General tuberculosis.
B. V.	G. P. 711	141	1,840	1,790	20 days 5th generation	371 days	D. 82 days	Extensive tuberculosis of the lungs; numerous nodules in the kidneys; many lymphatic glands affected; spleen normal; some doubtful foci in the liver.
		142	1,800	1,450	,,	,,	D. 101 days	Liver and spleen normal; tuberculosis of lungs, kidneys, inguinal, axillary, iliac, portal and bronchial glands; slight tuberculosis of diaphragm and pleura.
	Heifer 80	213	1,370	1,400	20 days 10th generation	418 days	D. 68 days	General tuberculosis; all organs and glands affected, lungs severely; local lesion very large, situated between the scapulæ.

* D. signifies that the animal died.

SUBCUTANEOUS INOCULATIONS—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under cultivation since isolation.	Duration of Life	RESULT.
B. VI.	Original material	130	520	480	21 days 3rd generation	154 days	D. 95 days	General tuberculosis, lungs chiefly affected; the omentum, serous surface of coecum and pleura showed tuberculous nodules.
		132	1,130	1,520			D. 85 days	As in Rabbit 130 but more severe tuberculosis of omentum, peritoneum and pleura.
	G.P. 1015	182	2,050	1,550	20 days 6th generation	248 days	D. 65 days	Large caseous tumour between scapulæ; adjacent glands caseous; a few tubercles in spleen, liver and kidneys; lungs packed with caseous masses; many glands tuberculous.
		183	2,270	1,880			D. 83 days	Large ulcerated caseous abscess over right hip; caseation of adjacent glands; one tubercle in the spleen; a few in the liver; numerous nodules in the kidneys; lungs extensively tuberculous; most of the lymphatic glands were affected.
B. VII.	G.P. 1017	177	2,080	1,690	20 days 6th generation	247 days	D. 63 days	Caseous abscess on left dorsum ilii; pus had burrowed in subcutaneous tissues of left groin and abdominal wall; six yellow tubercles in the spleen, and a few in the liver and on the diaphragm; numerous tubercles in the kidneys; lungs packed with caseating masses; almost all lymphatic glands affected.
		178	1,180	1,170			D 81 days	Large caseous abscess in subcutaneous tissues of left lumbar region: tuberculosis of nearest glands, kidneys and lungs severely affected; one tubercle in spleen; liver normal.
B. VIII	Original material	254	3,190	1,770	21 days 18th generation	321 days	D. 89 days	General tuberculosis: all organs affected, lungs severely.
		257	680	770			D. 22 days	Large area of extravasated blood in left groin (death possibly the result of an injury); there was a caseous ulcer in abdominal wall and a few caseous tubercles in inguinal and iliac glands
B. IX.	G.P. 1069	209	1,350	1,050	20 days 11th generation	249 days	D. 38 days	Firm caseous mass on left side of neck; adjacent glands caseous; numerous tubercles in all organs; lungs packed with coalescing caseating tubercles; all lymphatic glands affected.
		210	1,370	1,200			D. 45 days	General tuberculosis; local lesion between scapulæ; tubercles in spleen and liver few in number; fairly numerous miliary tubercles in the kidneys; lungs filled with confluent caseous tubercles.
B. X	Original material (through G.P. 1070)	269	2,050	1,270	20 days 13th generation	295 days	D. 97 days	General tuberculosis; all glands and organs affected, lungs severely, being almost completely caseous.
		271	820	720			D. 64 days	Tuberculosis: no tubercles seen in spleen and liver; lungs packed with coalescing caseating nodules; numerous caseating nodules in the kidneys.

Subcutaneous Inoculations—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under cultivation	Duration of Life.	Post-mortem Results.
B. XI.	Rabbit 66	165	1,600	1,640	22 days 7th generation	154 days	D. 55 days	Very large local lesion; numerous nodules in all organs; lungs practically caseous throughout; all lymphatic glands affected.
		188	2,520	1,650	19 days 7th generation	164 days	D. 67 days	General tuberculosis; lungs severely affected, being filled with coalescing caseous nodules.
B. XII.	Rabbit 89	232	1,020	780	20 days 9th generation	193 days	D. 42 days	General tuberculosis; local lesion on left scapula; tubercles few in liver and spleen.
		233	900	82			D. 80 days	General tuberculosis; very numerous nodules in the lungs and kidneys; a small number in the spleen and liver.
B. XIII.	Original material (through Rabbit 116).	275	720	640	20 days–12th generation	217 days	D. 45 days	Large firm caseous tumour at seat of inoculation: neighbouring glands enlarged and caseous: spleen normal; liver, numerous psorosperm nodules, no tubercles. The kidneys contained a small number of caseating nodules. The lungs were pinkish and crepitant, and contained fairly numerous caseating nodules ranging from a pin's head to a pea.
		277	1,370	1,180			D. 44 days	Caseous ulcer: nearest glands caseous: spleen and liver normal: the kidneys contained altogether four small tubercles: the lungs were not severely affected; they contained fairly numerous caseating nodules ranging in size from a pin's head to a split pea. There was a large flattened cavity with a yellow lining in the subcutaneous tissues around the left thorax, extending from the vertebral column to the costal cartilages (not tuberculous).
B. XIV.	Original material.	246	1,880	1,250	19 days–11th generation	194 days	D. 86 days	General tuberculosis of the usual type.
		251	690	1,020			D. 89 days	Tuberculous: liver and portal glands were normal: the spleen contained two yellow caseous tubercles: there were numerous nodules in the kidneys: the lungs were extensively caseated, the anterior lobes being quite solid.
B. XV.	Original material.	207	1,260	1,120	21 days–9th generation	169 days	D. 69 days	Local ulcer: nearest glands caseous: spleen normal: a few doubtful tubercles in the liver: numerous miliary tubercles in the kidneys: lungs severely affected, the tissue being extensively replaced by caseating tuberculous tissue; thoracic, lumbar and iliac glands slightly affected.
		290	1,300	900			D. 58 days	General tuberculosis: some doubtful points were seen in the liver in which no T.B. were found.

Subcutaneous Inoculations—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Culture Inoculated.	Total period under cultivation	Duration of Life.*	Post-mortem Results.
B. XVI.	Original material.	298	1,450	1,230	21 days 8th generation	143 days	D. 52 days	Tuberculosis of all organs except the liver: lungs closely beset with coalescing caseating nodules: thoracic, portal and mesenteric glands showed a few caseous foci.
B. XVII.	Original material.	264	1,020	850	20 days-6th generation	94 days	D. 67 days	General tuberculosis: lungs and kidneys severely affected.
		265	560	750			D. 70 days	General tuberculosis.
B. XVIII.	Original material.	341	1,030	1,200	21 days 8th generation	147 days	D. 62 days	General tuberculosis; lungs very closely beset with caseating nodules.
		336	1,010	1,130	,,	,,	K. 79 days (dying)	Tuberculosis of all organs except liver, which appeared normal: lungs severely affected.
B. XIX.	Original material.	358	2,070	1,700	20 days 8th generation	113 days	D. 75 days	Tuberculosis of all organs except liver: there were a few tubercles in the spleen: very numerous nodules in kidneys and lungs; abdominal lymphatic glands normal, thoracic slightly affected.
B. XX.	Original material.	374	2,200	1,560	20 days 7th generation	115 days	D. 73 days	General tuberculosis: all organs affected, lungs severely.
B. XXI.	Original material.	364	880	740	18 days 6th generation	91 days	D. 70 days	General tuberculosis.
		350	1,880	1,350	24 days 4th generation	117 days	D. 79 days	Tuberculosis of all organs except liver; spleen only slightly affected, contained 3 yellow tubercles.
B. XXII.	Original material (G.P. 1,509)	418	1,650	1,180	20 days 6th generation	109 days	D. 79 days	General tuberculosis, similar to that in Rabbit 350 (Virus XXI.).
B. XXIII.	Original material.	383	1,850	1,120	20 days 6th generation	110 days	D. 49 days	General tuberculosis; lungs extensively consolidated and advanced in caseation.
B. XXIV.	Original material.	389	1,740	1,420	20 days 6th generation	110 days	D. 81 days	General tuberculosis: tubercles in all the organs, very numerous in the kidneys and causing almost complete consolidation of the lungs.
B. XXV.	Original material.	431	1,490	1,350	20 days 4th generation	71 days	D. 86 days	General tuberculosis; lungs very closely beset with caseating nodules.

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* K signifies that the animal was killed.

SUBCUTANEOUS INOCULATIONS—*continued.*

Dose: 1·0 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Culture Inoculated.	Total period under cultivation	Duration of Life.	POST-MORTEM RESULTS.
B. XXVII.	Original material.	503	1,330	890	21 days 4th generation	56 days	D.114 days	Ulcerated, caseous tumour. $1\frac{1}{2} \times 1 \times \frac{1}{2}$. Adjacent glands enlarged and caseous. Other lymphatic glands were only slightly affected, containing discrete caseous tubercles. The spleen was normal. There was one tubercle in the liver, and a few miliary grey tubercles in each kidney. The lungs were less severely affected than usual, and showed a considerable amount of pinkish crepitant tissue; they contained, however, fairly numerous miliary caseous tubercles, here and there aggregated into small groups, and a few larger caseous nodules.
B. XXVIII	Original material.	897	1,170	1,050	21 days 6th generation	137 days	D. 4 days	Coccidiosis of liver.
B. XXIX.	Original material.	909	1,450	1,370	20 days 7th generation	129 days	D. 81 days	Large caseous abscess with a small ulcer on the surface; adjacent glands enlarged and caseous; lungs and kidneys closely filled with caseating nodules and tubercles. Moderately numerous miliary tubercles in the spleen and numerous grey points in the liver. Thoracic glands caseous. Numerous caseous nodules in coecum and small intestines, some ulcerated on the mucous surface.
B. XXX.	Original material.	918	1,720	1,250	20 days 4th generation	83 days	D. 126 days	Large caseous abscess, the skin over which showed a small opening; adjacent glands and most of the thoracic and abdominal lymphatic glands were tuberculous; there were three tubercles in the spleen and a moderate number in the kidneys; the lungs were enlarged and contained large confluent masses of caseating nodules; there were a few caseous tubercles in the thyroid body and early tuberculosis of the right knee joint.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN.

SUBCUTANEOUS INOCULATIONS.—*continued.*

Dose : 0·1 Milligramme.

Number of Virus.	Source of Culture.	Number of Rabbit.	Initial weight in grammes.	Final weight in grammes.	Age and Generation of Culture Inoculated.	Total period under cultivation since isolation.	Duration of Life.	RESULT.
B. I.	Cow 44.	83	1,200	1,400	20 days 3rd generation	217 days.	D. 105 days	Ulcerated caseous lesion; neighbouring glands caseous; liver and spleen apparently normal; kidneys showed a moderate number of nodules, largest 3 m.m. in diameter; lungs beset with caseous nodules and masses, the cephalic lobes being extensively caseated. Bronchial and mediastinal glands slightly affected. Caseous foci in portal and gastric glands and slight tuberculosis of diaphragm.
		84	1,140	1,050	,,	,,	D. 68 days	Lungs extensively caseated. The spleen contained three caseous tubercles; the liver about half-a-dozen. There were numerous nodules in the kidneys and most of the lymphatic glands were affected.
	Cow 40.	111	1,120	900	21 days 15th generation	91 days	D. 113 days	General tuberculosis. Numerous tubercles in the omentum.
B. II.	Heifer 66.	123	830	1,360	20 days 9th generation	357 days	D. 137 days	Result similar to that in Rabbit 83.
		124	860	820			D. 67 days	Inoculation partly intraperitoneal; omentum very thick and extensively caseated; general disseminated tuberculosis.
B. III.	Original material.	101	1,660	1,440	20 days 7th generation	427 days	K. 102 days (dying)	Result similar to that in Rabbit 83.
		102	2,130	1,670			D. 99 days	Ditto, except that spleen contained three yellow tubercles.
B. IV	Original material.	87	1,240	1,350	20 days 12th generation	356 days	D. 105 days	Result similar to that in Rabbit 83.
		88	1,140	1,120			D. 72 days	Ulcerated local lesion; adjacent glands caseous; three tubercles in the spleen and a few in the liver; numerous caseating nodules in the kidneys; lungs closely packed with caseous tubercles and masses; caseous foci in the ileum, appendix and bronchial glands.
B. V.	G.P. 711.	126	770	890	20 days 3rd generation	336 days	D. 107 days	As in Rabbit 83.
B. VI.	G.P. 1014	108	1,310	1,050	20 days 3rd generation	91 days	D. 49 days	General tuberculosis. Lungs severely affected. There were a few tubercles in the omentum.
		109	1,540	850	,,	,,	D. 97 days	Result similar to that in Rabbit 84.
B. XV.	Original Material.	286	1,510	1340	21 days 9th generation	169 days	D. 68 days	General tuberculosis; lungs severely affected; kidneys packed with tubercles.

LIST OF RABBITS INOCULATED WITH CULTURE OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

SUBCUTANEOUS INOCULATIONS—*continued.*

Dose : 0·1 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes	Final Weight in Grammes	Age and Generation of Subculture Inoculated.	Total period under cultivation.	Duration of Life.	POST-MORTEM RESULTS.
B. XVI.	Original material	297	1,270	1,200	21 days 8th generation	143 days	D. 101 days	Small local caseous ulcer; nearest glands enlarged and caseous; spleen normal; liver showed some doubtful foci (No T.B.); there were numerous caseating nodules in the kidneys, 1 to 4 mm. in diameter: the lungs were almost entirely solid and replaced by caseating tuberculous tissue; several lymphatic glands were affected.
B. XVIII.	Original material	340	420	400	21 days 8th generation	147 days	D. 57 days	General tuberculosis of the usual type.
		335	410	520		147 days	D. 66 days	
B. XIX.	Original material	475	1,200	1,030	20 days 13th generation	182 days	D. 83 days	General tuberculosis. Only one tubercle in the liver. Lungs packed with caseating nodules.
B. XX.	Original material	491	2,080	2,120	21 days 14th generation	206 days	D. 82 days	Firm caseous tumour, not ulcerated. Adjacent glands caseous. Nine caseous tubercles in spleen. Liver normal. Numerous nodules in the kidneys. Lungs packed with caseating nodules.
B. XXI.	Original material	356	610	530	18 days 6th generation	91 days	D. 18 days	Death from psorosperm disease of the liver.
B. XXII.	Original material (through G.P. 1509)	421	1,150	1,300	20 days 6th generation	109 days	D. 113 days	Small firm caseous tumour with a small ulcer. Adjacent glands caseous. Liver and spleen normal. The kidneys contained very numerous nodules. The lungs were enlarged and composed practically throughout of caseating tissue. Most of the lymphatic glands were slightly affected.
B. XXIII.	Original material	385	1,270	1,000	20 days 6th generation	110 days	D. 79 days	General tuberculosis; all organs affected except the liver.
B. XXIV.	Original material	391	1,220	980	20 days 6th generation	110 days	D. 48 days	Small caseous ulcer; tuberculosis of neighbouring glands; four yellow tubercles in the spleen; three doubtful points in the liver (No T.B.); about a dozen opaque miliary tubercles in each kidney; numerous caseous miliary tubercles in the lungs, here and there confluent. Abdominal and thoracic lymphatic glands contained small caseous foci.
B. XXV.	Original material	434	1,030	1,300	20 days 4th generation	71 days	D. 79 days	Large caseous abscess with a sinus communicating externally. Adjacent glands caseous. Peritoneum and omentum slightly affected. Spleen normal. Few doubtful points in liver. Numerous nodules in the kidneys. Lungs packed with coalescing caseating nodules.
B. XXVI.	Original matter	518	2,480	1,600	20 days 6th generation	111 days	D. 81 days	General tuberculosis; lungs severely affected.
B. XXVIII.	Original material.	898	1,550	1,000	21 days 6th generation	137 days	D. 70 days	Very large caseous tumour with a slightly ulcerated surface; adjacent glands enlarged and caseous; three tubercles in the spleen; a few in each kidney and numerous caseating tubercles in the lungs which were crepitant; thoracic glands enlarged and caseous.
B. XXX.	Original material.	919	1,550	1,650	20 days 4th generation	83 days	D. 109 days	General tuberculosis of the usual type.

SUBCUTANEOUS INOCULATION.

Dose: 0·01 Milligramme.

No. of Virus.	Source of Culture.	No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Sub-culture Inoculated.	Total period under Cultivation	Duration of Life.	POST-MORTEM RESULTS.
B. XXVI.	Original material.	514	1,200	950	20 days 6th generation	111 days	D. 121 days	On the left side of the abdomen there was a caseous softening tumour, the size of a hen's egg, the skin over which showed two small ulcers; the adjacent inguinal glands and the iliac glands on both sides were caseous throughout; the spleen contained one minute tubercle. There were a few doubtful points in the liver; the kidneys contained fairly numerous caseating nodules, larger in the left than in the right; the lungs were soft and crepitant, they contained a few irregular caseous areas, up to 4 mm. in diameter, and a moderate number of discrete caseous tubercles; there were numerous caseous "perlsucht" growths on the parietal pleura; many lymphatic glands contained small caseous foci.

ANALYSIS OF RESULTS.

Method of Inoculation.	Dose.	Number of Rabbits.	Duration of Life in Days.	Average.
Intravenous	1·0 mg.	13	10 to 21	14·3
	0·1 mg.	47	11 to 34	20·3
Intraperitoneal	1·0 mg.	53	11 to 38	17·8
	0·1 mg.	33	14 to 40	22·9
	0·01 mg.	9	22 to 65	35·0
Subcutaneous	1·0 mg.	52	38 to 126	72·8
	0·1 mg.	26	49 to 137	87·6

A SERIES OF YOUNG RABBITS INOCULATED INTRAPERITONEALLY WITH GRADUATED DOSES OF CULTURE DERIVED FROM THE ORIGINAL MATERIAL OF VIRUS B. IV.

The culture used was 20 days old, 22nd generation ; total period under cultivation since isolation, 575 days.

No. of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Dose.	Duration of Life.	Result.
196	580	520	1 cc. of a culture suspension estimated to contain 0·1 mg. of tubercle bacilli	Died. 15 days	Omentum slightly thickened, a few minute grey foci on parietal peritoneum, similar but more numerous foci on large intestine and mesentery, extremely minute grey specks in liver and spleen, ? a few in each kidney. T.B. numerous in liver, spleen and lung.
197	640	640	1 cc. of a 1 in 10 dilution of above suspension	Died. 22 days	Omentum slightly thickened and caseating, moderate number of pearly tubercles on parietal and visceral peritoneum, numerous whitish tubercles in liver and spleen,a few tubercles in each kidney, moderate number of caseating tubercles in lungs, many lymphatic glands affected.
198	550	550	1 cc. of a 1 in 100 dilution	Died. 27 days	As in Rabbit 197, but tubercles not so numerous on peritoneum and in the spleen.
199	680	650	1 cc. of a 1 in 1,000 dilution	Died. 47 days	Omentum thickened and caseous, numerous opaque tubercles on visceral peritoneum and mesentery, none on parietal peritoneum, a few tubercles on the kidneys, numerous in liver and spleen, lungs extensively caseated, all glands affected.
200	560	470	1 cc. of a 1 in 10,000 dilution	Died. 40 days	Omentum slightly thickened, moderate number of tubercles on mesentery, and meso-colon, more numerous on diaphragm, fairly numerous tubercles in spleen and liver, a few in the kidneys, numerous discrete miliary tubercles in lungs.
201	550	520	1 cc. of a 1 in 100,000 dilution	Died. 30 days	Fairly numerous tubercles on the mesentery, a few on the meso-colon and in the spleen and kidneys, numerous greyish white specks in liver (T.B.) and sparsely scattered tubercles in the lungs.
202	500	750	1 cc. of a 1 in 1,000,000 dilution	Died. 68 days	Omentum very thick and caseous, a few scattered tubercles on the visceral peritoneum, none on the parietal, a few tubercles in liver (T.B.) and kidneys, numerous caseous nodules in spleen. Lungs almost entirely solid, with yellow caseous masses, all lymphatic glands affected.
203	500	420	1 cc. of a 1 in 10,000,000 dilution	Died. 29 days	Omentum retracted and thickened, a few minute tubercles on colon, meso-colon and diaphragm, a few small tubercles in spleen and liver, kidneys appear normal, a few small opaque grey tubercles in the lungs, minute foci in thoracic glands.
204	670	800	1 cc. of a 1 in 100,000,000 dilution	Died. 89 days	General tuberculosis ; omentum thickened and caseating ; a few tubercles on the mesentery and on the serous surface of the large intestine ; none on the parietal peritoneum.
195	620	670	1 cc. of a 1 in 1,000,000,000 dilution	Died. 82 days	General tuberculosis.

A SERIES OF RABBITS INOCULATED INTRAPERITONEALLY WITH GRADUATED DOSES OF CULTURE DERIVED FROM HEIFER 80, VIRUS B. IV.

The culture used was 21 days old, 19th generation; total period under cultivation since isolation, 642 days.

Number of Rabbit.	Initial Weight in Grammes.	Final Weight in Grammes.	Dose.	Duration of Life.	Result.
493	2,130	1,320	1 cc. of a culture suspension estimated to contain 9·01 mg. of tubercle bacilli	Died. 63 days	There were caseous nodules in the subcutaneous and muscular tissues of the abdominal wall: the inguinal glands were caseous throughout. The omentum was greatly thickened, and almost completely caseous. There were fairly numerous caseous tubercles on the parietal and visceral peritoneum. The spleen was a little enlarged and contained moderately numerous yellow miliary tubercles. The liver showed minute grey points (T.B.) and the gall bladder four small caseous nodules ulcerated internally. Caseating nodules were moderately numerous in the kidneys and very numerous in the lungs. The bronchial and mesenteric glands were partly, the sternal glands completely, caseous. The portal and axillary glands contained pin-head sized caseous tubercles.
494	1,950	1,150	1 cc. of a 1 in 100 dilution of above suspension	Died. 118 days	General tuberculosis; the omentum showed caseous tubercles along the free margin; there were two or three caseous tubercles on the parietal and visceral peritoneum. Lungs contained numerous caseous nodules and masses; liver normal; spleen and kidneys contained moderately numerous caseous nodules.
495	2,250	1,600	1 cc. of a 1 in 10,000 dilution	Died. 74 days	Omentum retracted, showed along free margin irregular reddish-grey masses beset with caseous foci, and nearer the stomach discrete tubercles. There were two tubercles on the parietal peritoneum, and sparsely scattered miliary tubercles on the mesentery and visceral peritoneum. The spleen contained a moderate number of yellow caseous tubercles; the kidneys a few caseating tubercles up to 2 mm. There were a few opaque grey miliary tubercles in the liver (no T.B. found), and numerous irregular caseous nodules, varying much in size, in the lungs. The bronchial glands were partly, the sternal glands completely, caseous. All other lymphatic glands showed caseation to some extent.
496	2,200	1,830	1 cc. of a 1 in 100,000 dilution	Killed. 118 days	General tuberculosis; numerous large caseous nodules in omentum, and a few caseous tubercles on peritoneum; liver and spleen normal; a few tubercles in the kidneys; numerous caseous tubercles and nodules in the lungs.
497	1,800		1 cc. of a 1 in 1,000,000 dilution	Killed. 118 days	Organs and glands free from tuberculosis.
498	1,380		1 cc. of a 1 in 10,000,000 dilution	Died. 56 days	Abscess on right side of jaw and neck. Lungs congested. No sign of tuberculosis in any organ or gland.

INOCULATION EXPERIMENTS ON GUINEA-PIGS.

INOCULATION EXPERIMENTS ON GUINEA-PIGS.

Since the experimental work at Walpole began nearly 2,000 guinea-pigs have been inoculated with tuberculous material of bovine origin.

The great majority of these have been inoculated with emulsions of tuberculous tissues, or with tuberculous milk, either to confirm the naked eye diagnosis of a lesion or to test for the presence of the tubercle bacillus. Many guinea-pigs have been inoculated to keep a strain living in the tissues of an animal for the purpose subsequently of obtaining a culture, should for any reason the direct cultures fail.

Besides these a special series of guinea-pigs has been inoculated with culture from thirty different viruses, the dose in each case being 0·1 mg.

All the viruses possess high virulence for the guinea-pig and are capable of setting up in them fatal general tuberculosis, even when inoculated in excessively minute doses.

The appearance and distribution of the lesions vary with the duration of life of the animal and are determined to a large extent by the number of bacilli inoculated and the mode of injection.

With large doses of bacilli the duration of life is shorter and the tuberculous process more acute than when small doses are employed. Also animals inoculated intraperitoneally die sooner than those inoculated subcutaneously when the dose of the infecting agent is large; with very small doses animals inoculated intraperitoneally often live as long as, or longer than, those inoculated subcutaneously with the same dose.

GENERAL DESCRIPTION OF LESIONS PRODUCED.

Subcutaneous Inoculations.

With Culture.

Forty-one guinea-pigs have been inoculated subcutaneously in the wall of the abdomen (between the umbilicus and pubis) with culture from thirty different viruses, each animal receiving 0·1 mg.

Two of these died prematurely in 1 and 10 days respectively; the others died of general tuberculosis in periods varying from 29 to 74 days.

The following is a description of the lesions which are found on post-mortem examination: there is invariably an ulcer at the seat of inoculation: this may be shallow and show no caseation except under the margins, or may have a thick caseous base, the floor of which is covered by a dry caseous scab.

The superficial inguinal, the iliac and the sternal glands are enlarged and usually caseous throughout; the axillary, bronchial and portal glands are generally partly caseous, but, if the animal has lived some time, may be entirely converted into caseous substance; other glands of the body are usually affected, containing caseous nodules of various sizes.

The spleen is enlarged and shows its substance closely packed with coalescing caseating tubercles, or extensively replaced, chiefly around the margins and on the convex surface, by firm yellowish white necrotic tissue; the organ is rarely adherent to the abdominal wall.

The liver in early cases is normal in size and mottled with irregular canary-yellow patches and greyish foci of necrosis; in animals which have lived longer periods the liver shows some degree of enlargement and the surface may be irregular; the tissue is paler and firmer than normal, and the necrotic patches large and often of an olive green colour.

The lungs are usually crepitant, but may show patches of collapse; they contain a varying number of discrete caseating tubercles, ranging from 1 to 2 mm. in diameter; in several cases the pleural cavities have been found filled with fluid, and the lung tissue almost completely collapsed and consolidated.

The kidneys are not very susceptible to tuberculosis, and when affected show usually one or two miliary tubercles only.

The suprarenal bodies may occasionally contain tubercles. The lymphoid follicles in the cæcum are frequently caseous. Tubercles are sometimes found on the pleura and in the heart, in the latter case generally under the pericardium.

With Tissue Emulsions.

The duration of life of guinea-pigs that have died of tuberculosis after subcutaneous inoculation of emulsions of tuberculous tissues has varied from 27 to 146 days.

The type of disease produced by the inoculation of tissue emulsions is the same, when the duration of life is the same, as that produced by the inoculation of culture.

In guinea-pigs that have lived a long time, three months or more, the organs and glands may present rather unusual appearances.

The spleen sometimes attains enormous dimensions, and may be necrotic almost throughout, or firm dark red, and present very few necrotic areas; in a few instances death was apparently caused by spontaneous rupture of the organ and hæmorrhage into the peritoneal cavity; in one case the substance of the spleen was riddled with thin-walled cavities containing thin canary-yellow mucoid pus; calcareous particles have frequently been detected in the necrotic areas.

The liver in chronic cases often becomes very greatly enlarged, and undergoes pronounced fatty and fibroid changes; in these cases the surface is very irregular, the substance is yellowish and sometimes extensively replaced by large greenish patches of necrosis; these patches may break down and form cavities filled with ill-formed pus; in one case the liver was so fatty that the whole organ floated in water, and in several cases whole lobes have been converted into a dense greyish-white fibroid tissue.

The nodules in the lungs may soften and form cavities, or coalesce and extensively replace the lung parenchyma; in these cases the lung is sometimes found to be adherent to the chest wall.

Lymphatic glands may be converted into thin-walled cysts filled with ill-formed pus, or be composed of a dense translucent fibroid tissue containing small abscess cavities or yellow points which are sometimes gritty.

Intraperitoneal Inoculations.

With Culture and Tissue Emulsions.

The duration of life of guinea-pigs inoculated intraperitoneally with 0·1 mg. of culture has varied from 10 to 32 days, the average period being 18·8 days. The duration of life of guinea-pigs inoculated intraperitoneally with tissue emulsions has varied from 8 to 140 days.

In guinea-pigs which die in less than 14 days, whether inoculated with culture or emulsions, the tuberculosis produced presents the following features. In the muscle wall of the abdomen around the site of entry of the needle, there is a small yellow patch of necrosis. The omentum is thickened, contracted and composed of firm caseating tissue, which is commonly adherent to many of the surrounding structures, chiefly to the posterior surface of the liver and the small intestines, and occasionally to the floor of the abdomen and the stomach as well. The parietal peritoneum is inflamed and covered with a thin greyish speckled membrane which can be readily peeled off. The mesentery is contracted, thickened and covered with a membrane similar to that on the peritoneum. In the peritoneal cavity there is a slight excess of fluid, and strands of a fibrinous exudation stretch between the parietal and visceral peritoneum.

The spleen is enlarged and generally glued to the wall of the abdomen; the Malphigian bodies are enlarged, and the pulp is speckled with minute grey points which are most plainly visible from the surface. The liver is beset with numerous minute grey or yellowish-grey foci.

The kidneys are unaffected.

The pleural cavities are filled with clear serous fluid and the lungs are collapsed and often almost completely consolidated; in the dark red hepatised portions minute grey points are often seen under the pleura.

Lymphatic glands: the pyloric, lumbar (retro-peritoneal) and ventral mediastinal glands are always more severely affected than any other glands and are enlarged and in most cases caseous throughout; the portal and other abdominal lymphatic glands are usually enlarged and caseous in the cortices only; the bronchial glands are slightly enlarged and may or may not contain minute caseous foci.

In guinea-pigs which have lived longer than 14 days *i.e.*, up to three weeks or a month, an eruption of minute tubercles is seen on the parietal peritoneum, mesentery and mesocolon; these are often so numerous as to form in places a continuous uniform layer; occasionally the peritoneum shows patches of thickening to which various structures may be adherent and in the mesentery the tissues around the vessels may be thickened and tuberculous. The omentum is larger and more advanced in caseation and is usually not so universally adherent to the surrounding structures, as in the more acute cases.

The spleen may or may not be adherent to the wall of the abdomen; it is moderately enlarged, soft and shows on section grey tubercles (enlarged Malphigian corpuscles) which may have opaque centres and be confluent around the margins of the organ. The foci in the liver and lungs are larger and tubercles may be found in the kidneys. The pleural cavities generally contain fluid but are sometimes free from it. The pleura is often covered with an eruption of small tubercles.

With smaller and smaller doses of tubercle bacilli the lesions in the organs begin to resemble more and more those produced by subcutaneous inoculation.

The peritoneum shows fewer and fewer tubercles and when very small doses are administered is generally not affected.

The omentum with moderate doses of bacilli sometimes forms a very large transverse lobulated tumour, always thickest near the pylorus; it is smooth and yellowish externally, free from adhesions and composed of dense fibro-caseous substance which may show areas of softening. With very small doses the omentum contains discrete caseous nodules and translucent tubercles or small irregular masses of aggregated nodules.

Course of Infection.

Two series of nine guinea-pigs were inoculated subcutaneously with culture with a view to obtaining information as to the course of infection after subcutaneous inoculation of bovine tubercle bacilli.

The cultures used were from Virus B. I. and Virus B. III. and each guinea-pig received 0·1 mg.

In each series seven guinea-pigs were killed at intervals of five days, the remaining two being allowed to die naturally.

These experiments were carried out before it was known that tubercle bacilli, when inoculated subcutaneously, are rapidly distributed over the body by the blood stream.

The experiments are of interest however as showing the distribution of the tuberculosis at various periods after subcutaneous inoculation and the earliest times at which lesions first become visible in the different organs and glands. The results are given in two tables, pages.

LIST OF GUINEA-PIGS INOCULATED WITH CULTURE OF BOVINE ORIGIN.

Dose in Each Case: 0·1 Milligramme.

Number of Virus.	Source of Culture.	Number of Guinea-pig.	Initial Weight in Grammes.	Final Weight in Grammes.	Age and Generation of Subculture inoculated.	Total Period under cultivation since Isolation.	Duration of Life in days.		Post-mortem Results.
							Subcut.	Intrap.	
B. I.	Cow 44	1,046	270	230	20 days, 3rd Generation		52		General Tuberculosis.
		1,047	280	200		207 days		18	General Tuberculosis.
		1,122	280	270	20 days, 5th Generation	217 days	49		General Tuberculosis.
		1,123	240	180		217 days		24	General Tuberculosis.
	Cow 40	1,265	190	240	21 days, 15th Generation	591 days	46		General Tuberculosis.
		1,266	270	220				28	General Tuberculosis.
	Monkey 76	1,437	510	380	20 days, 5th Generation	91 days	41		General Tuberculosis.
		1,438	520	420				46	General Tuberculosis.
B. II.	Heifer 66	1,281	300	250	20 days, 9th Generation	357 days	65		General Tuberculosis.
		1,282	220	180				24	General Tuberculosis.
	Calf 134	1,367	580	330	20 days, 5th Generation	227 days	37		General Tuberculosis.
		1,368	440	300				18	General Tuberculosis.
B. III.	Original Material	1,163	220	240	20 days, 7th Generation	427 days	59		General Tuberculosis.
		1,164	330	160				18	General Tuberculosis.
		1,224	300	250	18 days, 8th Generation	455 days	45		General Tuberculosis.
		1,225	260	170				16	General Tuberculosis
B. IV.	Original Material	1,048	310	260	20 days, 9th Generation	316 days	39		General Tuberculosis.
		1,049	280	200				10	General Tuberculosis.
		1,124	320	300	20 days, 12th Generation	356 days	27		General Tuberculosis.
		1,125	270	220				22	General Tuberculosis
		1,323	400	270	20 days, 16th Generation	450 days	1		
		1,324	350	270				21	General Tuberculosis.
		1,380	220	260	20 days, 18th Generation	505 days	57		General Tuberculosis.
		1,381		180				16	General Tuberculosis.
B. V.	Guinea-pig 711 (inoculated with original material).	1,315	220	250	20 days, 3rd Generation	336 days	42		General Tuberculosis.
		1,316	320	270				20	General Tuberculosis.
		1,365	420	380	20 days, 5th Generation	371 days	47		General Tuberculosis.
		1,366	420	320				31	General Tuberculosis.
B. VI.	Guinea-pig 1,014 (inoculated with original material).	1,261	270	240	20 days, 3rd Generation	91 days	44		General Tuberculosis.
		1,262	250	300			64		General Tuberculosis.
		1,263	350	250				32	General Tuberculosis.
	Guinea-pig 1,015 (original material).	1,435	450	270	20 days, 6th Generation	248 days	47		General Tuberculosis.
		1,436	270	270				20	General Tuberculosis.
B. VII.	Guinea-pig 1,017 (original material).	1,433	450	370	20 days, 6th Generation	247 days		21	General Tuberculosis.
		1,434	280	250			38		General Tuberculosis.
B. VIII.	Original Material	1,501	330	270	21 days, 18th Generation	321 days	43		General Tuberculosis.
		1,502	410	290				17	General Tuberculosis.
B. IX.	Original Material	1,456	610	400	20 days, 12th Generation	258 days		23	General Tuberculosis.
		1,457	480	310				20	General Tuberculosis.
B. X.	Guinea-pig 1,070 (original material).	1,512	270	220	20 days, 13th Generation	295 days	37		General Tuberculosis.
		1,513	200	190				12	General Tuberculosis.
B. XI.	Rabbit 66 (inoculated with original material).	1,431	270	230	22 days, 7th Generation	154 days	40		General Tuberculosis.
		1,432	270	220				13	General Tuberculosis.
B. XII.	Original Material	1,518	480		20 days, 12th Generation	275 days	46		General Tuberculosis.
		1,519	350	280				17	General Tuberculosis.
B. XIII.	Original Material through Rabbit 116	1,516	280		20 days, 12th Generation	217 days	34		General Tuberculosis.
		1,517	250	210				16	General Tuberculosis.
B. XIV.	Direct	1,498	380		19 days, 11th Generation	194 days	29		General Tuberculosis.
		1,499	320	290 220				17	General Tuberculosis.
B. XV.	Direct	1,528	250		21 days, 9th Generation	169 days	44		General Tuberculosis.
		1,529	260					19	General Tuberculosis.
B. XVI.	Direct	1,536	500		21 days, 8th Generation		39		General Tuberculosis.
		1,537	700	390				15	General Tuberculosis.

List of Guinea-pigs Inoculated with Culture of Bovine Origin—*continued.*

Dose in Each Case: 0·1 Milligramme.

Number of Virus.	Source of Culture.	Number of Guinea-pig.	Initial Weight in Grammes	Final Weight in Grammes.	Age and Generation of Subculture inoculated.	Total Period under cultivation since Isolation.	Duration of Life in days.		Post-mortem Results.
							Subcut.	Intrap.	
B.XVII.	Direct	1,504	320	230	20 days, 6th Generation	94 days	39		General Tuberculosis
		1,505	320	280				18	General Tuberculosis.
B. XVIII.	Original material	1,601	450	320	21 days, 8th Generation,	147 days	36		General Tuberculosis.
		1,602	320	230				16	General Tuberculosis.
		1,603	300	230	21 days, 8th Generation	147 days	37		General Tuberculosis.
		1,604	260	190				17	General Tuberculosis.
B. XIX.	Original material	1,586	1,090	700	21 days, 5th Generation	71 days	22		General Tuberculosis.
		1,587	840	550				14	General Tuberculosis.
		1,627	230	270	20 days, 8th Generation	113 days	29		General Tuberculosis.
		1,628	320	210				18	General Tuberculosis.
B. XX.	Original material	1,631	340	270	20 days, 7th Generation	115 days	48		General Tuberculosis.
		1,632	350	220				19	General Tuberculosis.
B. XXI.	Original material	1,625	250	190	18 days, 6th Generation	91 days	32		General Tuberculosis.
		1,626	250	180				15	General Tuberculosis.
B. XXII.	Original material (through G.P. 1509.)	1,670	550	290	20 days, 6th Generation	109 days	43		General Tuberculosis.
		1 671	470	350				14	General Tuberculosis.
B. XXIII.	Original material	1,650	370	250	20 days, 6th Generation	110 days	42		General Tuberculosis.
		1,651	380	270				13	General Tuberculosis.
B. XXIV.	Original material	1,652	320	250	20 days, 6th Generation	110 days	38		General Tuberculosis.
		1,653	340	170				14	General Tuberculosis.
B. XXV.	Original material	1,674	600	400	20 days, 4th Generation	71 days	35		General Tuberculosis.
		1,675	560	370				13	General Tuberculosis.
B. XXVII.	Original material	1,746	—	300	21 days, 4th Generation	56 days	74		General Tuberculosis.
		1,747	—	290				23	General Tuberculosis.
B. XXVIII	Original material	2,064	490	300	21 days, 6th Generation	137 days	74		General Tuberculosis.
		2,065	420	270				12	General Tuberculosis.
B. XXIX.	Original material	2,089	350	250	20 days, 7th Generation	129 days	41		General Tuberculosis.
		2,090	530	320				15	General Tuberculosis.
B. XXX.	Original material	2,087	470	260	20 days, 4th Generation	83 days	65		General Tuberculosis.
		2,088	370	220				16	General Tuberculosis.

GUINEA-PIGS INOCULATED WITH ESTIMATED DOSES OF BOVINE TUBERCLE BACILLI IN TISSUE EMULSIONS AND IN MILK.

The animals are arranged in the order of dose.

Virus.	Material obtained from	Number of Guinea-pig.	Weight in grammes.	Number of Tubercle Bacilli.	Duration of Life in Days.		Killed or Died.	Result.
					Intrap.	Subcut.		
B. I.	Pig 8	425	450	None found in the emulsion.	—	55	D.	General Tuberculosis.
		426	470		—	35	D.	General Tuberculosis.
		427	—		92	—	D.	General Tuberculosis.
B. II.	Calf 22	393	270	133	—	73	D.	General Tuberculosis.
		394	280	133	57	—	D.	General Tuberculosis.
		395	270	133	—	67	D.	General Tuberculosis.
B. I.	Pig 12	602	170	900	—	18	D.	General Tuberculosis.
		603	390	900	—	60	D.	General Tuberculosis.
		604	310	900	68	—	D.	General Tuberculosis.
		605	310	900	71	—	D.	General Tuberculosis.
B. I.	Calf 126	671	320	5,000	63	—	D.	General Tuberculosis.
		672	420	5,000	—	117	D.	General Tuberculosis.
		673	370	5,000	49	—	K.	General Tuberculosis.
		674	400	5,000	48	—	D.	General Tuberculosis.
B. II.	Guinea-pigs 996–999.	1,025	300	5,000	—	47	D.	General Tuberculosis.
		1,026	270	5,000	47	—	D.	General Tuberculosis.
B. I	Calf 102	582	210	5,500	—	65	D.	General Tuberculosis.
		583	230	5,500	—	35	D.	General Tuberculosis.
		584	230	5,500	22	—	D.	General Tuberculosis.
		585	210	5,500	31	—	D.	General Tuberculosis.
B. II.	Heifer 66	634	300	9,333	—	88	D.	General Tuberculosis.
		635	300	9,333	—	71	D.	General Tuberculosis.
		636	260	9,333	18	—	D.	Slight Tuberculosis.
		637	260	9,333	40	—	D.	General Tuberculosis.
B. I.	Heifer 30	374	250	11,666	—	56	D.	General Tuberculosis.
		375	250	11,666	91	—	D.	General Tuberculosis.
		377	360	11,666	50	—	D.	General Tuberculosis.
B.I.	Cow 64, Milk	808	160	50,000	—	40	D.	General Tuberculosis.
		809	150	50,000	17	—	D.	General Tuberculosis.
		818	200	50,000	—	37	D.	General Tuberculosis.
		819	140	50,000	22	—	D.	General Tuberculosis.
B.I.	Cow 164, Milk	1,106	220	50,000	—	31	D.	General Tuberculosis.
		1,107	200	50,000	31	—	D.	General Tuberculosis.
		1,148	250	50,000	—	28	D.	General Tuberculosis.
		1,149	260	50,000	—	67	D.	General Tuberculosis.
		1,150	240	50,000	26	—	D.	General Tuberculosis.
		1,151	360	50,000	18	—	D.	General Tuberculosis.
B.I.	Cow 44, Milk	754	160	53,933	—	24	D.	General Tuberculosis.
		755	140	53,933	—	17	D.	Slight Tuberculosis.
		756	130	53,933	13	—	D.	General Tuberculosis.
		757	140	53,933	19	—	D.	General Tuberculosis.

Guinea-pigs inoculated with Estimated Doses of Tubercle Bacilli in Tissue Emulsions and in Milk—*continued.*

Virus.	Material obtained from	Number of Guinea-pig.	Weight in grammes.	Number of Tubercle Bacilli.	Duration of Life in Days.		Killed or Died.	Result.
					Intrap.	Subcut.		
I.	Cow 64, Milk	790	190	54,000	—	32	D.	General Tuberculosis.
		791	160	54,000	14	—	D.	Tuberculous Peritonitis
		800	140	54,000	—	31	D.	General Tuberculosis.
		801	150	54,000	—	40	D.	General Tuberculosis
		802	140	54,000	33	—	D.	General Tuberculosis
		803	150	54,000	21	—	D.	General Tuberculosis.
IV.	Calf 120	667	350	100,000	52	—	D.	General Tuberculosis.
		668	400	100,000	140	—	D.	General Tuberculosis.
V.	Original material	706	270	1,000,000	—	46	K.	General Tuberculosis.
		707	200	1,000,000	—	46	K.	General Tuberculosis.
		708	180	1,000,000	—	46	K.	General Tuberculosis.
		709	250	1,000,000	21	—	D.	General Tuberculosis.
		710	180	1,000,000	18	—	D.	General Tuberculosis.
		711*	220	1,000,000	30	—	D.	General Tuberculosis.
IV.	Original material	503	290	1,014,200	—	63	D.	General Tuberculosis.
		504	290	1,014,200	—	90	D.	General Tuberculosis.
		505	250	1,014,200	59	—	D.	General Tuberculosis.
		506	250	1,014,200	66	—	D.	General Tuberculosis.
IV.	Calf 120	664	330	1,014,386	—	52	D.	General Tuberculosis.
		665	370	1,014,386	38	—	D.	General Tuberculosis.
		666	350	1,014,386	39	—	D.	General Tuberculosis.
III.	Original material	438	300	1,460,000	—	4	D.	General Tuberculosis.
		439	310	1,460,000	—	31	D.	General Tuberculosis.
		440	350	1,460,000	27	—	D.	General Tuberculosis.
		441	360	1,460,000	40	-	D.	General Tuberculosis.
IV.	Guinea-pigs 1,011 and 1,012.	1,059	150	1,467,000	—	36	D.	General Tuberculosis.
		1,060	170	1,467,000	21	—	D.	General Tuberculosis.
II.	Guinea-pigs 996–999.	1,027	330	4,480,000	—	57	D.	General Tuberculosis.
		1,028	290	4,480,000	22	—	D.	General Tuberculosis.

* Inoculated intrathoracically.

The Subculture was 61 days old; 17th generation.

Dose in each case, 0·1 mg.

Number of Guinea-Pig.	Duration of Life.	Killed or Died.	Local Lesion.	Superficial Inguinal glands.		Axillary glands.		Deep Inguinal glands.		Iliac glands.		Sternal glands.		Lumbar glands.	Lungs.	Bronchial glands.	Spleen.	Liver.	Portal glands.	Kidneys.	Manubrial glands.		Mesenteric gland.	Submental glands.	Cervical glands.	Submaxillary glands.	Submaxillary Salivary gland.	Heart.	Omentum.	Pleura.
				Right.	Left.	Right.	Left.	Right.	Left.	Right.	Left.	Right.	Left.								Right.	Left.								
914	5 days	Killed	In mid line, œdematous congested thickening. T.B.	+ T.B.	+ T.B.	-	-	- T.B.	-	-	- T.B.	-	-	-	-	-	- No T.B.	-	-	-	-	-	-	-	-	-		-	-	-
916	10 ,,	Killed	On right side not ulcerated. T.B.	◆ T.B.	◆ T.B.	◆ T.B.	+ No T.B.	- T.B.	-	◆ T.B.	◆ T.B.	◆ T.B.	?	- T.B.	-	-	- No T.B.	◆ T.B.	- T.B.	-	-	-	-	-	-	-		-	-	-
917	15 ,,	Killed	In mid line beginning to ulcerate.	◆	◆	- No T.B.	-	- T.B.	-	- No T.B.	-	+ T.B.	+	- No T.B.	-	◆ No T.B.	- No T.B.	- No T.B.	- No T.B.	-	-	◆	- No T.B.	-	-	-		-	-	-
915	20 ,,	Killed	On right side; ulcerated.	◆	◆	+	+ No T.B.	-	-	-	-	◆	◆	-	-	-	◆ T.B.	◆	+ No T.B.	-	◆	◆	-	-	-			-	-	-
922	25 ,,	Killed	On right side. Ulcerated.	◆	◆	◆	-	-	-	◆	◆	◆		-	◆	◆ T.B.	◆	◆	◆	-	◆	-	-	◆ T.B.	-	-		-	-	-
919	30 ,,	Killed	On right side. Ulcerated.	◆	◆	◆	-	◆	-	◆	◆	◆	◆	◆	◆ T.B.	◆	◆	◆	◆ T.B.	-	◆	◆	-	◆	◆	◆		-	-	-
918	35 ,,	Killed	In mid line. Ulcerated.	◆	◆	+	◆	◆	◆	◆	◆	◆ T.B.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	-	-	-
920	57 ,,	Died	To right side. Ulcerated.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆ T.B.	-	◆	◆	◆	◆	◆	◆		◆	◆ One or two tubercles.	◆ Pleura filled with fluid.
921	71 ,,	Died	On right side. Ulcerated.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆ One tubercle.	◆	◆	◆	◆	◆	◆		-	-	◆

In Guinea-pig 921 all the lymphoid follicles in the large intestine were enlarged and caseous.

EXPLANATION OF SIGNS AND ABBREVIATIONS.

-	Means	no macroscopic evidence of tuberculosis.
+	,,	enlargement without caseation.
◆	,,	definite tuberculosis.
T.B.	,,	tubercle bacilli found in a smear preparation.
No T.B.	,,	no tubercle bacilli found in a smear preparation.

Guinea-pigs Inoculated Subcutaneously with Culture Derived from Cow 68. Virus B. III.
The subculture was 61 days old, 9th generation.
Dose in each case, 0·1 mg.

Number of Guinea-pig.	Weight in grammes	Duration of life.	Killed or Died.	Local lesion.	Superficial inguinal glands.		Axillary glands.		Deep inguinal glands.		Iliac glands.		Sternal glands.		Manubrial glands.		Lumbar glands.	Lungs.	Bronchial glands.	Spleen.	Liver.	Portal gland.	Kidneys.	Mesenteric glands.	Submaxillary glands.	Submental glands.	Cervical glands.	Intestines.	Heart.	Pleura.	Omentum.
					Right.	Left.	Right.	Left.	Right.	Left.	Right.	Left.	Right.	Left	Right.	Left.															
923	360	5 days	Killed	Local thickening, not ulcerated, T.B. found.	– No T.B.	– No T.B.	–	–	–	– No T.B.	–	–	–	–	–	–	–	–	–	– No T.B.	–	–	–	–	–	–	–	–	–	–	–
924	360	10 ,,	,,	On right side caseating lesion not ulcerated, T.B.	◆ T.B.	– T.B.	+ No T.B.	+ One T.B.	+ No T.B.	–	◆ T.B.	– No T.B.	–	◆ T.B.	+	+ T.B.	–	–	–	– No T.B.	? No T.B.	– T.B.	–	–	–	–	–	–	–	–	–
925	400	15 ,,	,,	Large caseous tumour on right side.	◆	– T.B.	– No T.B.	–	+ No T.B.	–	+ No T.B.	–	–	–	◆	–	–	–	–	? No T,B,	–	– No T.B.	–	–	–	–	–	–	–	–	
926	360	20 ,,	,,	On right side ulcerated.	◆	◆	◆	◆	◆	–	◆	–	◆ T,B.	◆	◆	◆	– No T.B.	◆ One tubercle T.B.	–	◆	◆	◆ T.B.	–	–	–	–	–	–	–	–	–
927	360	25 ,,	,,	On right side ulcerated.	◆	◆	◆	–	–	–	◆	◆	◆	◆	◆	◆	– coeliac ◆	◆	◆ T.B.	◆	◆	◆		–	– T.B.	–	–	–	–	–	–
928	280	30 ,,	,,	On right side ulcerated.	◆	◆	◆	◆	–	◆	◆	◆	◆	◆	◆	◆	◆ and coeliac	◆ T.B.	◆	◆	◆	◆ T.B.	–	◆	◆	◆	◆	◆ Focus near pylorus T.B.	–	–	–
929	230	35 ,,	,,	To left side ulcerated.	◆	◆	◆	–	◆	+	◆	◆	◆	◆	◆	◆	– coeliac ◆	◆	◆	◆	◆	◆ T.B.		◆	◆	◆	◆	–	–	–	–
931	340	38 ,,	Died	To right side ulcerated.	◆	◆	◆	◆			◆	◆	◆	◆	◆	◆	◆ and coeliac	◆ T.B.	◆	◆	◆	◆	◆ Two tubercles T.B.	◆	◆	◆	◆	◆ coecum	–	– cavities filled with fluid.	–
930	350	55 ,,	,,	In mid-line ulcerated.	◆	◆	◆	◆	–	◆	◆	◆	◆	◆			◆ and coeliac	◆	◆	◆	◆	◆	◆ T.B.	◆	◆	◆	◆	◆ T.B.	◆ T.B.	–	–

Explanation of Signs and Abbreviations.

–	Means	no macroscopic evidence of tuberculosis.
+	,,	enlargement without caseation.
◆	,,	definite tuberculosis.
T.B.	,,	tubercle bacilli found in a smear preparation.
No T.B.	,,	no tubercle bacilli found in a smear preparation.

INOCULATION EXPERIMENTS ON RATS.

INOCULATION EXPERIMENTS ON RATS WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

With Tissue Emulsions.

Nine rats have been inoculated with tissue emulsions, six with the original material of Virus B. V. and three with an emulsion made from the prescapular gland of Calf 128 (Virus B. I.). None of these rats died of tuberculosis. One inoculated in the peritoneal cavity showed some small bodies (probably composed largely of inoculated material) in the omentum and on the liver, and a minute opaque point in an omental gland; in the others nothing of a tuberculous nature was seen beyond the site of inoculation.

With Culture.

Forty rats have been inoculated, 21 subcutaneously and 19 intraperitoneally with cultures of tubercle bacilli from 16 different bovine viruses.

The doses have varied considerably. It was at first intended to have a strictly comparative series, inoculating each rat with 1·0 mg. Six viruses were tested in this way but the results showed that the dose was too small to produce a fatal infection. All the rats lived a long time and, beyond a local lesion, were free from naked eye evidence of tuberculosis; microscopical examination, however, showed the presence of tubercle bacilli in some of the organs and glands.

Afterwards no general plan was followed with regard to dosage; usually what remained of an emulsion of culture after the inoculation of calves or rabbits was used for inoculating the rats. An inspection of the list shows that a dose of 10 mg. has been most frequently employed.

To subcutaneous inoculation of tubercle bacilli rats appear to be very refractory. Two rats have died of tuberculosis after subcutaneous inoculation, but in both cases there was reason to think that some of the fluid had been injected into the peritoneal cavity as well as into the subcutaneous tissues. Five rats have died from some intercurrent disease and two too early for tuberculosis to develop. The rest have been killed after long periods, and, with the exception of a local lesion, have shown no naked eye evidence of disease; tubercle bacilli have been found, however, in some of the organs and glands.

To intraperitoneal inoculation rats are more susceptible and, when the dose is sufficiently large, the animals die of tuberculosis; the smallest dose to produce a fatal infection has been 5 mg. One rat, No. 56, inoculated intraperitoneally, with 10 mg. of culture, was killed after 173 days, and showed no sign of disease. The others died in periods varying from 4 to 116 days.

The disease produced in rats by intraperitoneal inoculation differs in a striking manner from that produced in almost all other species of animals.

The rat dies as a result of the multiplication of the bacilli in its tissues and there is usually no development of the ordinary tubercle so characteristic of the disease in other animals. The organs and glands always contain numerous bacilli and bacilli have sometimes been demonstrated in the blood. The spleen is greatly swollen. The lungs are fuller and firmer than normal and have a congested mottled appearance. The bronchial glands are often enlarged, congested and œdematous. The liver is normal to the naked eye and generally the kidneys also. In two cases the kidneys have shown in the cortex numerous dark grey foci, resembling small tubercles, and in one the lungs were infiltrated with grey translucent foci.

Bacilli are disseminated throughout the body of the rat very early after inoculation, and when inoculated into the peritoneal cavity in large doses are absorbed in such numbers that the resistance of the animal is quickly overcome, the organisms multiplying in the organs and causing death, probably from toxæmia. With small non-fatal doses the rat is able to check undue multiplication and the bacilli reside in the tissues without producing harmful effects.

They retain their vitality in the body for long periods. From Rat 62, killed 194 days after inoculation, a culture was obtained direct from the spleen, and a guinea-pig inoculated with a tubercle from the omentum of Rat 42, killed 268 days after inoculation, developed tuberculosis.

To demonstrate the early dissemination of tubercle bacilli in the rat, two rats were inoculatied each with 10 mg. of culture in the subcutaneous tissues of the thigh. (It was found on post-mortem examination that the inoculation was partly intermuscular as well.)

One of the rats was killed 24 hours after inoculation, the other after 48 hours. In each case a guinea-pig was inoculated with some of the heart's blood and cultures were sown from the blood, marrow, and spleen pulp. (The medium used was the egg mixture which has been found to be the most reliable for raising cultures of the tubercle bacillus.)

In the first case the tubes sown from the blood and marrow remained sterile; one sown with a small quantity of spleen pulp grew ten discrete colonies of tubercle bacilli. The guinea-pig inoculated with the blood (about 1 c.c.) was killed 22 days after inoculation and showed a caseous tubercle on the peritoneal ligament of the left cornu of the uterus and early caseation of the left iliac glands with no sign of disease elsewhere.

In the second case the tube inoculated from the spleen developed 46 colonies of tubercle bacilli and one of the tubes sown with blood developed one; another tube from the blood and one from the marrow remained sterile. The guinea-pig inoculated with the blood died in 14 days and showed no evidence of tuberculosis.

LIST OF RATS INOCULATED WITH TISSUE EMULSIONS.

Virus.	Source of Emulsion.	Number of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Sub-cut.	
B I.	Calf 128	7	Not estimated		190 days (killed)	In the subcutaneous tissues of the abdominal wall there was a minute milky white, slightly gritty, focus. All the lymphatic glands and the organs were perfectly normal in appearance. Microscopical examination.—Numerous T.B. in the local lesion and in an inguinal gland ; no T.B. in the lung.
,,	,,	8	,,	52 days (killed)		The omentum, not thickened, contained three small dry whitish flakes. An omental gland, the size of a millet seed, showed in the centre a minute opaque white focus. The liver showed on the surface an opaque whitish flake, 3 mm in diameter, and a caseous tubercle, a little larger than a millet seed, embedded in the substance on the anterior surface. Other organs and glands were normal. Microscopical —T.B. were found in small number in the omental gland, in a splenic gland, and in the nodule on the surface of the liver ; T.B. were fairly numerous in a coeliac gland ; there were no T.B. in the spleen and a mesenteric gland.
,	,,	9	,,		281 days (killed)	At seat of inoculation opaque white, gritty tubercle smaller than a millet seed. There was no sign of disease elsewhere. Microscopical.—Numerous T.B. in local lesion and in an inguinal gland.
B. V.	Original Material	1	1,000,000 T.B.		213 days (killed)	Chalky white millet seed sized body in liver substance beneath capsule. Cephalic lobe of right lung consolidated. No sign of disease elsewhere. Microscopical.—One T.B. found in liver nodule.
,,	,,	2	,,		33 days (died)	In subcutaneous tissues of right groin yellow nodule, filled with soft caseo pus, the size of a wheat grain. Right lung in a state of red hepatisation. No sign of disease elsewhere. Microscopical.—T.B. numerous in local lesion and an inguinal gland ; fairly numerous in an iliac gland ; none found in the lung or spleen.
,,	,,	3	,,		19 days (killed)	In the subcutaneous tissues near the right groin there was a collection of yellow caseo-pus, the size of a barley grain. All the organs and lymphatic glands were perfectly normal to the naked eye. Microscopical.—T.B. numerous in local lesion and inguinal glands ; none found in the spleen.
,,	,,	4	,,	177 days (died)		The omentum contained a spherical yellow nodule, about 2 mm. in diameter, filled with thick, yellow pus. The right lung was completely consolidated, and of a reddish colour ; it contained three yellow nodules (not tuberculous) with thin walls and creamy purulent contents. No sign of disease elsewhere. Microscopical : Numerous T.B. in omental nodule : none in the pus from the lung.
,,	,,	5	,,	213 days (killed)		The omentum contained two yellowish white bodies, one the size of a millet seed, the other much smaller; these, when crushed between ground glass plates, were found to be hard and chalky in the centre. The cephalic lobes and the right middle lobe were dark red and consolidated ; they showed on section cavities (dilated bronchi) filled with a pale mucinous fluid and, in one case, yellow pus. Other organs and all lymphatic glands were normal. Microscopical.—A few degenerated tubercle bacilli were found in one of the nodules in the omentum ; no T.B. were found in the mucinous material from the lung.
,,	,,	6	,,	189 days (killed)		Omentum normal. In the suspensory ligament of the liver there was a hard, dry, whitish body, the size of a wheat grain, which, when crushed, was perceptibly gritty. The lungs were similar in appearance to those of Rat 5. Other organs and all the glands were normal. Microscopical.—A few T.B. were found in the nodule ; none in the lung.

LIST OF RATS INOCULATED WITH CULTURES OF TUBERCLE BACILLI OF BOVINE ORIGIN.

Virus.	Source of Culture	Number of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. I.	Cow 40	39	1·0 mg.	251 days (killed)		In the muscle wall on the left side of the abdomen there was a whitish tubercle, the size of a millet seed. Inguinal glands and all organs normal to the eye. Omentum normal. Microscopical examination.—A smear from the local tubercle showed very numerous short degenerate tubercle bacilli ; several T.B. were found in the left inguinal gland and a few in the lung and spleen.
,,	,,	40	1·0 mg.		251 days (killed)	In the subcutaneous tissues there were two pin-head sized whitish tubercles with soft centres. Inguinal and all other lymphatic glands normal. Liver, spleen, and kidneys normal. The lung contained a small group of translucent nodules containing a clear jelly-like material. Microscopical examination —There were numerous short T.B. in a local tubercle and fairly numerous T.B. in an inguinal gland ; in the latter chromatic granules were well-marked ; a few T.B. were found in an iliac gland and the spleen, and a good number in the lung (the tissue used for the latter smear was normal to the eye) ; no T.B. in the liver.
,,	Pig 16	47	15 mg.	54 days (died)		There was a spot of pus in the subcutaneous tissues of the abdominal wall (T.B.). The omentum contained several grey translucent tubercles, the size of millet seeds, and one slightly larger one with a softened centre. The spleen was greatly swollen and showed minute grey points. On the surface of the liver there were 3 or 4 hard yellow nodules the size of wheat grains, which extended a short distance into the liver substance ; the kidneys showed on the surface numerous dark grey points. The lungs were congested in patches ; no definite tubercles were seen, but in the congested areas there were some lighter coloured foci. Thoracic glands enlarged and congested. Microscopical.—T.B. were very numerous in the spleen, lungs, liver nodule. omentum, kidneys, iliac, and ventral mediastinal glands ; many of the bacilli were in clumps, and some were found in cells.
B. II.	Heifer 66	43	1·0 mg.		344 days (killed)	Small focus of yellow pus in subcutaneous tissues of abdominal wall ; inguinal gland normal. All organs normal in appearance. Microscopical examination.—There were numerous T.B. in the pus and a few degenerate vacuolated bacilli in an inguinal gland ; no T.B. were found in the spleen or lung.
	,,	44	1·0 mg.	334 days (killed)		All organs and glands normal in appearance. Microscopical.—No T.B. in spleen or lung.
B. IV.	Original Material (direct)	41	1·0 mg.		347 days (killed)	In the subcutaneous tissues of the abdominal wall there was a pin-head sized tubercle with a soft whitish centre and grey margins ; inguinal glands normal. All organs normal in appearance. Microscopical examination.—Numerous T.B. in local lesion ; none in inguinal gland and spleen.
	,,	42	1·0 mg.	265 days (killed)		Omentum, not thickened, contained a few hard greyish white nodules, the largest the size of a wheat grain (these were emulsified and inoculated into a guinea-pig which developed slight tuberculosis). The caudal lobes of the lungs showed several grey translucent nodules, ill-defined and without central necrosis ; there were a few similar ones in the cephalic lobes ; some of the bronchi contained whitish muco-pus. Other organs and all lymphatic glands were normal to the naked eye. Microscopical.—The emulsion of the omental nodules showed fairly numerous degenerate tubercle bacilli, and degenerate bacilli were found in the liver, spleen, lung, and a ventral mediastinal gland ; in the two latter they were moderately numerous.

List of Rats Inoculated with Cultures of Tubercle Bacilli of Bovine Origin—*continued.*

Virus.	Source of Culture.	Number of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. IV.	Chimpanzee 6.	57	10·0 mg.	40 days (died)		The lungs and some of the abdominal viscera of the animal were eaten by its companions. Sufficient of the latter remained however to show that the omentum was adherent and much thickened ; the liver showed on the surface patches of grey membrane but no foci internally ; a bit of the spleen was normal to the eye ; the kidneys showed in the cortices numerous small grey foci. Inguinal, cervical and submaxillary glands, normal. Microscopical.—Omentum, swarms of T.B. Kidney, very numerous T.B. ; numerous T.B. in liver and splen.
B. IV.	G.P. 1597 (inoculated with omentum of Rat 42)	86	10·0 mg. (approx.)	4 days (died)		Omentum retracted, thickened and opaque. All organs and glands normal to the naked eye. Microscopical.—Numerous T.B. in omentum, spleen, liver, mediastinal gland and kidney ; there were a few T.B. in the lung and in the bone marrow. A culture was obtained from the liver and inoculated into Rats 92 and 93.
B. IV.	Rat 86	92	5·0 mg.		240 days (killed)	Under the deep fascia of the left thigh muscles there was a lenticular-shaped opaque nodule, rather less than a split pea in size ; on section it contained caseo-pus. All the organs and glands were perfectly normal in appearance. Microscopical.—Numerous tubercle bacilli in the pus from the local lesion ; a few in the spleen ; none in the liver or lung.
		93	5·0 mg.	80 days (died)		The omentum, not thickened, contained two minute tubercles with opaque centres. On the suspensory ligament of the liver there was a small nodule which had a fibrous capsule and creamy purulent contents. The lungs had a congested mottled appearance on the surface, but were otherwise normal. The spleen was moderately large. Other organs and all lymphatic glands appeared normal. Microscopical.—Numerous T.B. in peritoneal nodule, lung, spleen, liver and marrow.

LIST OF RATS INOCULATED WITH CULTURES OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

Virus.	Source of Culture.	No. of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. V.	Original Material (through G.P. 711)	45	1·0 mg.		336 days (killed).	In the subcutaneous tissues there were four yellow nodules the largest 2·5 m.m. in diameter ; on section they were composed of dull white dry caseous material containing minute calcareous particles ; in the abdominal muscles there were two pin-head sized tubercles softened in the centre. The inguinal and all lymphatic glands were normal in size and appearance and all the organs were normal to the eye. Microscopical. Numerous short T.B. in a subcutaneous and in an intramuscular nodule, one doubtful bacillus in the left inguinal gland, four T.B. in the lung, and none in the spleen and liver.
,,	,,	46	1·0 mg.		274 days (died).	No local lesion ; spleen appeared enlarged ; the lungs contained 3 nodules filled with mucilaginous fluid (not tuberculous) ; other organs normal. Microscopical. —A few T.B. in the liver and kidney, fairly numerous T.B. in the spleen and lung substance (normal to the eye).
B. VI.	Original Material (through G.P. 1015.)	50	10·0 mg.		217 days (killed).	In subcutaneous tissues of right groin elongated softened caseous nodule, a little larger than a wheat grain ; all organs and glands normal to the eye. Microscopical.—Very numerous T.B. in local lesion ; numerous T.B. in right inguinal and right iliac glands ; no T.B. in spleen or lung.
,,	,,	51	10·0 mg.	39 days (died)		Omentum not thickened. Spleen very large, surface appeared as if dusted with minute grey specks. Liver and kidneys normal to the naked eye. Right lung solid, contained some large yellow nodules (not tuberculous). Left lung voluminous and congested in patches. Sternal glands enlarged and congested. Microscopical.—T.B. numerous in liver, spleen, lung, and sternal gland.
,,	,,	37	1·0 mg.		205 days (killed).	In the subcutaneous tissues at the seat of inoculation there were two spherical yellow nodules about 2 m.m. in diameter and one about 1 m.m. ; on section they were thin-walled and contained soft yellow pus. All organs and glands normal in appearance. Microscopical.—Numerous T.B. in local lesions ; moderate number in right inguinal gland, a few in right iliac ; 2 (?) small groups in lung ; none in liver or spleen.
B. VII.	Original Material (through G.P. 1017)	48	10·0 mg.		49 days (died)	Pea-sized nodule in subcutaneous tissues filled with caseo-pus. Inguinal glands normal in appearance. The lungs showed patches of consolidation ; the bronchi in the left lung were filled with muco-pus. Microscopical.—T.B. sparsely scattered in inguinal gland ; no T.B. in liver, spleen, lung, pus from bronchus or ventral mediastinal gland.
,,	,,	49	10·0 mg.	42 days (died)		A few small grey tubercles in the omentum which was a little thickened ; spleen greatly swollen, speckled with minute grey points. Lungs, congested, showed under the pleura minute grey spots, in the left caudal lobe there was a grey nodule from which purulent material could be squeezed ; there was a similar but smaller nodule in the right anterior lobe. All the lymphatic glands were enlarged and congested. Liver and spleen normal to the naked eye. Microscopical.—T.B. very numerous in liver, spleen, lung, mediastinal, inguinal, and sub-maxillary glands.

List of Rats Inoculated with Cultures of Tubercle Bacilli of Bovine Origin—*continued.*

Virus.	Source of Culture.	Number of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. VIII.	Original Material	60	10· mg.		17 days (died)	Small caseous abscess at site of inoculation; no sign of tuberculosis in any organ or gland. Microscopical.—A few T.B. found in liver, spleen and lung; none in heart's blood.
”	”	61	10·0 mg.	9 days (died)		On the parietal peritoneum near the xiphisternum there was a yellow nodule the size of a wheat grain, filled with yellowish-white pus. Spleen large and firm. Liver and kidneys normal. Lungs showed some patches of congestion. All the lymphatic glands of the body appeared a little enlarged, but there were no opaque foci. Microscopical.—Swarms of T.B. in peritoneal nodule; numerous T.B. in liver, spleen and inguinal gland; a few T.B. in a kidney; T.B. numerous in lung (not so numerous as in liver), majority in cells.
B. X.	Original Material (through G.P. 1072)	62	1·0 mg.	194 days (killed)		The omentum contained three translucent tubercles, the largest 1 mm. in diameter. Organs and glands normal to the naked eye. Microscopical.—Numerous T.B. in omental nodule, moderate number in liver, spleen and lung.
”	”	63	1·0 mg.		8 days (died)	No naked eye evidence of tuberculosis. Microscopical.—Moderate number of T.B. in inguinal gland; none in spleen, liver, kidney or heart's blood.
B. XI.	Original Material (through Rabbit 66)	52	50· mg.		132 days (died)	In the subcutaneous tissues of the abdominal wall there was a millet-seed sized nodule filled with yellowish-white pus. There were numerous yellow softened nodules in the lungs, not of a tuberculous nature; the right cephalic lobe was almost entirely filled with them. Other organs and glands were normal. Microscopical.—A few T.B. in the lung (normal tissue) and liver; none in the spleen.
B. XII	Original Material (through Rabbit 98)	55	10·0 mg.		62 days (died)	In the subcutaneous tissues there was a nodule the size of a split pea, with firm yellow centre and translucent margins. Inguinal glands normal. Omentum not thickened, contained a few small tubercles with yellow centres. Spleen enlarged, firm and red. Liver and kidneys normal. At anterior extremity of kidney large, soft tumour, consisting of grey and greyish red tissue showing on the surface large sub-capsular hæmorrhage (? enlarged suprarenal body). Lungs mottled with dark red patches of congestion. Microscopical.—Numerous T.B. in local lesion, omentum, spleen, liver, and lungs; a few T.B. in an inguinal gland and in the marrow; none in the tumour.
”		56	10·0 mg.	173 days (killed)		The organs and glands were perfectly healthy to the naked eye. Microscopical.—No T.B. in a mesenteric gland or in the spleen; a few were found in a smear made from the lung.
B XII	Original Material	67	10·0 mg.		233 days (died)	No local lesion. Inguinal glands and other lymphatic glands normal in appearance. The lungs were congested and filled the chest; the right anterior lobes were red and consolidated and showed on section numerous foci of pus exuding apparently from the bronchi; the caudal lobes were firmer than normal but were not consolidated; they showed on section purulent foci as in the right cephalic lobes. Other organs were normal. Cause of death—suppurative bronchitis. Microscopical.—A smear made from crepitant lung tissue showed numerous beaded T.B. mostly in clumps; one T.B. was found in the spleen; none in the pus from the lung.

LIST OF RATS INOCULATED WITH CULTURES OF TUBERCLE BACILLI OF BOVINE ORIGIN—*continued.*

Virus.	Source of Emulsion.	Number of Rat.	Dose.	Duration of Life.		RESULT.
				Intrap.	Subcut.	
B. XII.	—*continued.*	68	10·0 mg.	94 days (died)		There was a yellowish nodule on the peritonum. The spleen was enlarged. The lungs filled the pleural cavities and showed a greyish mottling on the surface. Other organs and glands were normal. Microscopical.—Smears from the liver, lung, spleen and a kidney showed very numerous T.B.; in a smear from the peritoneal nodule there was a moderate number and in one from a cervical gland none was found.
,,	,,	69	10.0 mg.	116 days (died)		The omentum contained three fibroid tubercles each a little larger than millet seeds. The spleen was enlarged, firm and dark red. Liver normal. On the surface of each kidney were numerous minute dark grey foci, irregular in outline. The lungs did not collapse and were firmer than normal; on the surface as well as on section there were numerous grey translucent foci (1 mm. or less in diameter) with ill-defined margins (?tuberculous infiltration); the bronchi contained a pale mucinous material. The bronchial glands were congested, but not apparently enlarged. Other lymphatic glands appeared normal. Microscopical.—Numerous T.B. in liver, spleen, kidneys, a mesenteric gland and a bronchial gland; smears made from a scraping of the cut surface of the lung and from a grey patch showed extremely numerous T.B.
B. XIII.	Original material (through Rabbit 116	65	1.0 mg.		200 days (killed).	No local lesion. All organs and glands normal to the naked eye. Microscopical.—No T.B. in spleen or lung, four found in an iliac gland.
,,	,,	66	1.0 mg.	4 days (died)		Lungs partly consolidated; no sign of disease elsewhere. Microscopical.—A few T.B. found in the spleen; none in the liver or lungs.
B. XIV.	Original material	58 One month old	25·0 mg.		10 days (died). Inoculation probably partly intra-peritoneal.	Small caseous nodule in subcutaneous tissues; omentum retracted, showed yellow foci; there was a small yellow nodule on the surface of the spleen, two or three on the diaphragm and a few on the peritoneum; there were some yellow points in the iliac and manubrial glands; the left lung showed dark areas of collapse; the right was quite solid; other organs normal to the eye. Microscopical. — T.B. very numerous in liver, lungs, iliac gland and peritoneal nodule.
,,	,,	59	25·0 mg.	223 days (killed)		Omentum and all organs and glands perfectly normal to the naked eye. Microscopical.—A few T.B. in the spleen and lung; none in the liver.
B. XV.	Original material.	70 1 month old	10·0 mg.		343 days (killed)	No local lesion. Organs and glands normal. Microscopical.—A few T.B. in an inguinal gland, in a bronchial gland and in the lung; none in the spleen.
,,	,,	71	10·0 mg.	109 days (died)		Carcass eaten.
B. XVI.	Original material	72 One month old	10·0 mg.		181 days (died)	Small local ulcer with caseous base and margins; in subcutaneous tissues near the ulcer were two small nodules with fibrous margins and softened centres. Inguinal and iliac glands normal; liver, spleen and kidneys normal. The right cephalic lobe was collapsed and consolidated and contained two grey translucent nodules; in the right caudal lobe there were two or three similar nodules; the left lung was hypertrophied and contained three or four grey translucent nodules up to 2 mm. in diameter. Microscopical.—Smears from an inguinal gland and an iliac gland showed numerous tubercle bacilli; smears from the spleen, a lung nodule and the sternal gland showed no tubercle bacilli.

List of Rats Inoculated with Cultures of Tubercle Bacilli of Bovine Origin—*continued.*

Virus.	Source of Culture.	Number of Rat.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. XVI.	—*continued.*	73 One month old	10·0 mg.	40 days (died).		In the splenic omentum there were two small opaque whitish bodies; the omentum was not thickened and there were no tubercles on the peritoneum. The spleen was enlarged; the liver normal. The kidneys showed on the surface many minute dark grey foci, and one or two small greyish white tubercles. The lungs were congested, but there were no solid areas; on the surface numerous small light grey areas were seen (? emphysematous); the lungs contained three or four small nodules containing yellow curdy pus. Bronchial and mediastinal glands congested. Microscopical.—Swarms of T.B. in spleen, mediastinal gland and lung tissue; numerous T.B. in liver and kidney; a few in the pus from a lung nodule.
B. XVIII.	Original Material.	89	10·0 mg.		1 day (killed).	Emulsion inoculated between the muscles of the thigh which was swollen. All the organs and glands of the rat were normal to the eye. A guinea-pig inoculated with about 1 c.c. of blood and killed twenty days later showed one caseous tubercle (T.B.) on peritoneal ligament of the left cornu of the uterus and early caseation of the left iliac gland.
		90	10·0 mg.		2 days (killed).	Left thigh swollen; inoculation chiefly intramuscular; organs and glands all perfectly normal in appearance. A guinea-pig inoculated with about 1 c.c. of blood died fourteen days later, and showed no sign of tuberculosis.
B. XXVI.	Original Material.	87	10·0 mg.	66 days (died).		Intestines and stomach much decomposed. The omentum was not thickened; it showed near the spleen one yellow pin-head sized tubercle. The spleen was large, firm, and dark red; no tubercles seen. The spleen and kidneys appeared normal. The lungs were crepitant and mottled with patches of congestion. Bronchial and mediastinal glands appeared normal. Microscopical.—Numerous T.B. in the spleen, liver, kidney and lung; very numerous T.B. in a mediastinal gland; no T.B. in the blood.

INOCULATION EXPERIMENTS ON MICE.

INOCULATION EXPERIMENTS ON MICE WITH TUBERCULOUS MATERIAL OF BOVINE ORIGIN.

In the early part of the experimental work a number of mice were inoculated with emulsions of bovine tuberculous tissues. Many of these died prematurely, from septic infection or other causes, whilst a few died and were eaten by their companions.

The results in fourteen cases are given; eleven were inoculated with an emulsion made from the original material of Virus B. V., each animal receiving approximately 1,000,000 tubercle bacilli, and three with an emulsion made from the prescapular gland of Calf 128, dose not estimated.

Eight of the animals were inoculated subcutaneously and six intraperitoneally.

The mice inoculated subcutaneously died in periods varying from 40 to 281 days. One died of tuberculosis in 139 days, bacilli being very numerous in the lungs; there were two yellow nodules in the peritoneal cavity and no lesion in the subcutaneous tissues, so there is the possibility that in this case the inoculation may have been mainly or wholly intraperitoneal. The other mice also died, the cause of death not being ascertained; in one no lesion was discovered anywhere; in the others there was a lesion at the seat of inoculation only. The mouse is therefore resistant to small doses of tubercle bacilli inoculated subcutaneously.

The six mice inoculated intraperitoneally died in periods varying from 39 to 122 days, and in all cases death appeared to be due to tuberculosis. Tubercle bacilli had multiplied in the tissues of the mice, and caused the death of the animals, but without setting up characteristic tuberculous lesions.

In this respect the acute disease in mice resembles that in rats; it differs in the formation in the peritoneal cavity of thin-walled nodules, filled with yellow pus, composed largely of tubercle bacilli (in one case one of these nodules was found in the lung).

Mice appear to offer less resistance to the growth of the tubercle bacillus in their tissues than do rats; four rats were inoculated intraperitoneally at the same time as the six mice, with equivalent doses of emulsion, and none developed tuberculosis.

LIST OF MICE INOCULATED WITH EMULSIONS OF BOVINE TUBERCULOUS TISSUES.

Virus.	Source of Emulsion.	Number of Mouse.	Dose.	Duration of life.		Result.
				Intrap.	Subcut.	
B. V.	Original material	19	1,000,000 T.B.		220 days (died)	In the subcutaneous tissues on the left side of the abdomen there was a pea-sized collection of caseo-pus. The lungs were congested but there were no tubercles. Other organs and all lymphatic glands were normal to the naked eye. Miscroscopical: Numerous T.B. in the pus; none found in the lungs.
”	”	20	”		196 days (died)	No local lesion was found. The lungs were congested, in places very deeply. Other organs and all the lymphatic glands appeared normal. Microscopical: No T.B. in an inguinal gland or in the lungs.
”	”	21	”		173 days (died)	In the subcutaneous tissues over the right margin of the thorax there was a small irregular yellowish white nodule composed of dry friable material. The axillary gland on the same side seemed a little enlarged but was not otherwise abnormal. Other lymphatic glands were normal in size and appearance. The lungs were very congested and œdematous. Abdominal organs normal. Microscopical: Numerous T.B. in local lesion; none in left axillary gland or in lung.
”	”	22	”	43 days (died)		There were two soft caseous nodules in the omentum and one over the right iliac crest. A few grey points were seen on the mesentery. The spleen was enlarged and showed one minute greyish-yellow point on the surface. The liver appeared enlarged and showed on the surface several yellow plaques and foci; substance normal. Kidneys normal. Lungs partly consolidated, mottled on the surface with greyish yellow foci. Microscopical: A smear made from the lung resembled a pure culture.
”	”	23	”	110 days (died)		The omentum contained an irregular yellow nodule, the size of a large pea, filled with thick yellow pus. There was a similar but smaller nodule on the peritoneum near the pelvis, and one on the right uterine ligament. There was a large nodule, slightly smaller than the omentum nodule, lying between the intestines and lumbar vertebrae. Near the portal fissure there was a soft yellow nodule, the size of a pea (? portal gland). There was a hemp-seed sized firm yellow nodule on the surface of the spleen, and a similar one on the surface of the liver; the substance of the spleen and liver appeared normal. On the pleural surface of the diaphragm there were three yellow nodules, each the size of a small pea, filled with yellow pus. The lungs were congested and mottled on the surface with irregular greyish-yellow foci; there were no definite tubercles. Miscroscopical: Smear preparations from the various nodules in the abdomen, a nodule on the diaphragm and the lung showed exceedingly numerous tubercle bacilli; they occurred mainly in clumps and were very beaded.
”	”	25	”		40 days (died)	In the right groin there was a small collection of caseo-pus; adjacent glands normal; all organs normal. Microscopical: Very numerous T.B. in local lesion; numerous T.B. in right inguinal gland; none in spleen or kidney.

LIST OF MICE INOCULATED WITH EMULSIONS OF BOVINE TUBERCULOUS TISSUES—*cont.*

Virus.	Source of Emulsion.	Number of Mouse.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. V.	Original material	26	1,000,000 T.B.		40 days (died)	Minute yellow point in subcutaneous tissues of abdominal wall. No sign of tuberculosis elsewhere. Microscopical: Numerous T.B. in local lesion; moderately numerous in right inguinal and right iliac glands.
,,	,,	27	,,		40 days (died)	On the right side of the chest wall there were two collections of yellow tenacious pus; one was situated in the subcutaneous tissues, the other under the deep fascia; the latter communicated externally by a small opening which was covered by a scab. The lungs were very congested and speckled on the surface with grey points. The spleen appeared slightly enlarged. Other organs and all lymphatic glands normal. Microscopical: The pus was mainly composed of tubercle bacilli; T.B. were very numerous in the lungs, moderately numerous in the iliac glands; No T.B. in spleen or lungs.
,,	,,	28	,,	39 days (died)		Omentum thickened, retracted and caseating; there was a soft yellow mass between the stomach and liver (? glandular); in the lumber regions there were five yellow cheesy collections on the peritoneum. The spleen showed two grey foci on the surface; the liver several yellowish plaques. Each kidney showed in the cortex a minute slightly projecting greyish-white tubercle. The right lung was almost completely consolidated; the left was partly consolidated; the solid parts were firm and greyish-white. There was a soft caseous nodule on the left side of the diaphragm, and one in the ventral mediastinum near the apex of the heart. Microscopical: Smears from spleen and kidney tubercle showed very numerous tubercle bacilli.
,,	,,	29	,,	40 days (died)		Attached to the peritoneum near the umbilicus there was an irregular yellow cheesy mass, 7 by 4 mm.; on the floor of the abdomen near the pubis there was a small nodule filled with tenacious yellow pus. On the anterior surface of the liver there were several thin greyish yellow plaques, firmly adherent to the capsule. The omentum contained four yellow softened nodules. Spleen, liver and kidneys normal to the naked eye. The lungs were congested and showed grey points on the surface; the right caudal lobe was adherent to the chest wall, and contained in the posterior part an abscess cavity; on the costal pleura there was a small softened nodule. The sternal and dorsal mediastinal glands were yellow and softened. The iliac glands were enlarged, caseous and softened. The lumbar and mesenteric glands contained caseous foci. Microscopical: Very numerous T.B. in omental and peritoneal nodules; numerous beaded T.B. in lung abscess; a few short well-stained T.B. in the spleen.

List of Mice Inoculated with Emulsions of Bovine Tuberculous Tissues—*cont.*

Virus.	Source of Emulsion.	Number of Mouse.	Dose.	Duration of Life.		Result.
				Intrap.	Subcut.	
B. I.	Calf 128	31	Number of tubercle bacilli not estimated. Dose of emulsion, 1 cc.		139 days (died)	There was no lesion in the subcutaneous tissues, and the omentum and peritoneum were normal. Near the liver in the position of the portal and coeliac glands there were two thin-walled pea-sized nodules filled with tenacious yellowish purulent material. The lungs were congested and showed on the surface numerous small light-coloured areas, irregular in outline; these did not appear to extend into the substance and were not perceptible to the touch. Other organs appeared normal. Microscopical: The pus from the two nodules in the peritoneal cavity seemed to be composed almost entirely of tubercle bacilli; there were very numerous tubercle bacilli in the lungs.
„	„	36	„	122 days (died)		Lying free in the peritoneal cavity were three or four small soft cheesy masses moulded into irregular shapes by the abdominal viscera (? inoculated material). On the anterior surface of the liver there were four irregular yellow patches up to 2 mm. in diameter; they were composed of dry friable material in which gritty particles could be detected; there was a similar millet-seed sized body on the surface of the spleen. Near the hilum of the liver there was a thin-walled nodule (? portal gland), the size of a pea, filled with soft caseo-pus. The lungs were congested in patches and showed greyish-yellow foci, irregular in outline (? emphysematous). Microscopical: Smears from a peritoneal nodule, the nodules on the surface of the liver and spleen, the portal gland and lung, showed very numerous tubercle bacilli; the peritoneal nodules and the pus from the portal gland were composed almost entirely of tubercle bacilli, only a little amorphous *débris* being seen between the bacillary clumps.
„	„	35	„	115 days (died)		In the peritoneal cavity near the pelvis there was a thin-walled yellow nodule filled with creamy pus; there was a similar pea-sized nodule in the hilum of the liver. The lungs were congested and consolidated, and showed on the surface numerous irregular yellowish foci. No lesions were observed in any of the other organs. Microscopical Examination: There were very numerous tubercle bacilli in the nodules in the peritoneal cavity and in the lung.
„	„	32	„		281 days (died)	Body extremely fat. In the subcutaneous tissues at the site of inoculation there was a whitish point. The lungs showed a few small greyish patches of consolidation but no definite tubercles. Microscopical: No T.B. in local lesion or in an inguinal gland; 3 T.B. were found after long search in a smear made from the lung.

FEEDING EXPERIMENTS.

INTRODUCTION.

In this part of the Appendix all the feeding experiments with tubercle bacilli of bovine origin are collected together and considered.

The experiments are divided into five series, each series including, besides a detailed description of the lesions produced in each animal, an account of the experiments and the general results, and a tabular analysis.

In each series animals of different species, and, in many instances, of different ages, have been used.

The first series of experiments is composed of animals fed with the milk of a cow artificially infected in the udder with tuberculosis.

In the second series some of the animals were fed with milk from a cow with tuberculous disease of the udder, whilst the rest were fed with an emulsion made from the tuberculous organs of guinea-pigs that had been inoculated with the milk.

The animals in the third series were all fed with culture derived from the original material of virus B IX.

The fourth series contains animals which have been fed at different times and with tuberculous material from different viruses; this does not, as do the first series, form a uniform series: and whereas in the first three series, single doses of tubercle bacilli were given (except in the case of a few guinea-pigs), in this series many were fed during several weeks with tuberculous material.

The experiments in the fifth series were carried out with a view to ascertaining the paths of infection from the alimentary tract: animals were fed with large doses of tubercle bacilli and killed at short intervals subsequently, emulsions of various organs being made and inoculated into guinea-pigs; in the case of the dogs chyle from the thoracic duct was collected under an anæsthetic before the animal was killed, and tested for the presence of tubercle bacilli.

Finally, a general summary of all the experiments is given at the end of the report.

FIRST SERIES OF SPECIAL FEEDING EXPERIMENTS.*

In December, 1903, I was directed by the Commission to carry out a series of experiments with a view to obtaining some information as to the course of infection in tuberculosis produced by feeding.

In the first series three species of animals were used, namely six calves, twelve pigs and six baboons, and these were fed with single doses of tuberculous milk obtained from a cow artificially infected in the udder with tuberculosis.

The different doses given contained 1,000,000, 5,000,000 and 10,000,000 tubercle bacilli, and these were estimated by Dr. Eastwood by counting.

Two baboons, one young and one adult, four pigs, two young and two adult, and two calves each received 1,000,000 tubercle bacilli; two baboons, two calves, and four pigs, divided into young and adult, each received 5,000,000, and a similar series received 10,000,000.

The virus used was of a high degree of virulence for the ox, the cow No. 64 which supplied the milk succumbing to an intramammary inoculation of 1,000,000 tubercle bacilli (500,000 into each of two quarters) in 48 days.

This virus (B.I.) passed through one generation of guinea-pigs, and then into bovines caused a very severe infection in all the animals inoculated, but, after artificial cultivation through the guinea-pig, produced in two series of adult bovines a very mild type of disease; on further passage, however, through two calves in succession the virus again produced virulent effects, and when inoculated into the udder of a cow in small dose produced a rapid infection with marked constitutional disturbance, the animal having to be killed 41 days after inoculation. The cow from which the tuberculous milk was obtained was inoculated with the milk of the latter cow, with the result stated above. (*See* Table 1A.)

BABOONS.

One of the young baboons, No. 4, dose 5,000,000, was killed when dying 35 days after it was fed, and was found to have general tuberculosis most severe in the lungs; the tuberculosis was evidently of old standing and a culture isolated from the lung had the cultural characters of a slightly virulent organism.

The corresponding adult baboon killed after 36 days showed a small erosion and a submucous caseating nodule in the duodenum, and enlargement, caseation and softening of one retro-pharyngeal gland and five mesenteric glands; in the lung there was a doubtful nodule which, inoculated into a guinea-pig, failed to produce tuberculosis; all other organs and glands were normal to the naked eye, but an emulsion from the spleen caused general tuberculosis in the guinea-pig.

Another baboon (No. 12), an adult, dose 10,000,000, was strangled by a baboon in an adjacent cage, when the experiment had lasted 65 days; the post-mortem examination showed one or two minute ulcers in the ileum, great enlargement, caseation and softening of the mesenteric, coeliac, renal, and thoracic lymphatic glands, numerous large caseating nodules in the spleen and a few small tubercles in the lungs and liver.

The corresponding young baboon was killed after about the same interval of time in order to compare the extent of the disease in the young and adult. The post-mortem examination showed that the young animal was much less severely affected than the old one; there was one minute ulcer in the ileum, the mesenteric glands were enlarged, caseous and softened, the spleen contained a thin-walled abscess, the liver a caseous nodule, the lung a small tubercle and a bronchial gland a doubtful focus.

Of the two baboons which received 1,000,000 tubercle bacilli the younger was killed when moribund 96 days after feeding; the post-mortem examination showed in the ileum a primary tuberculous ulcer, ½ in. by ¼ in. along the convexity and secondary tuberculous ulceration along the line of attachment of the thickened and infiltrated mesentery, great enlargement, caseation, and softening of the mesenteric glands, tuberculosis of the omentum, peritoneum, and thoracic glands, and numerous nodules in the lungs, liver, and spleen.

The adult animal (No. 8) was killed when ill 97 days after she was fed, and showed ulceration and caseation of both tonsils, enlargement and caseation of the cervical and pharyngeal glands, and severe general tuberculosis; the intestines and mesenteric glands were not affected. The peritoneum was tuberculous, infection taking place apparently from the spleen.

In the latter two baboons there was very little difference in the extent of distribution of the tuberculosis, but it was observed that the nodules in the spleen, and some of the nodules in the liver and omentum were larger and more advanced in caseation in the old animal than those in the corresponding organs of the young one.

PIGS.

Six of the pigs, three young and three adult, were killed in periods varying from 38 to 46 days and six in periods varying from 103 to 117 days; two of the pigs in each series, one young and one adult, had each received 1,000,000, two 5,000,000 and two 10,000,000.

All the pigs became tuberculous. The extent and severity of the disease being greater in the young pigs than in the older ones, and greater in the pigs that lived the longest and in those that received the larger doses.

The intestines showed definite lesions in three only out of the twelve animals fed; in a fourth there was a doubtful ulcer; the intestinal lesions were few in number and inconspicuous, appearing in the form of one or two minute erosions of the mucous membrane without definite caseation at the bases. In two of the pigs the tonsils were affected, one of the cases being in an animal in which the intestines were not involved.

Eleven of the animals showed disease of the mesenteric glands, the remaining one, in which the mesenteric glands were normal, showing, however, tuberculosis of the submaxillary and colic glands.

The submaxillary and pharyngeal glands were tuberculous in eight cases, and in six of these the tonsils and pharynx were normal; in several instances the submaxillary glands attained a large size and were more extensively tuberculous than the mesenteric glands.

From the glands in connection with the alimentary tract tubercle bacilli in the young pig appear to be quickly disseminated into the lungs and liver; in the three young animals killed a short time after inoculation there was a distinct relationship between the number of tubercles in these organs and the number of bacilli ingested.

The spleen in five out of the six adult pigs was normal, and in the majority of the young animals was only slightly affected.

The kidneys showed doubtful lesions in three cases.

The portal and bronchial glands, as shown by these experiments, become tuberculous after the liver and lungs.

The serous surfaces are apparently not affected until late in the disease, the right side of the diaphragm in contact with the liver showing nodular tuberculosis before the omentum or pleura.

CALVES.

Of the two calves which received the smallest dose, one, No. 150, showed after 64 days extensive tuberculosis of one pharyngeal gland and no sign of disease elsewhere; the other showed two nodules in the small intestine and one in the large and two ileo-colic glands were tuberculous; in the latter calf, killed 98 days after the experiment began, the tuberculosis had spread to the thorax, a few gritty tubercles being found in the dorsal mediastinal glands (the nodules in the lung of this animal were not tuberculous).

The four calves which received the larger doses (5,000,000 and 10,000,000) were more severely affected than those which had 1,000,000; there were numerous and widespread lesions in the small intestines and well-marked tuberculosis of the mesenteric glands; the ileocolic glands were affected in every case, but not to the same extent as the mesenteric, and a few colic glands in three cases showed slight tuberculosis.

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* Special precautions have been taken in these, and all other feeding experiments, to guard against the possibility of animals becoming tuberculous through inhalation of infected dust.

Three of these calves were killed 36 days after feeding, and so there was little disease to be seen beyond the nearest glands; in one, a gluteal gland contained a nodule, and in another the spleen and the long caudal mediastinal gland, although not obviously tuberculous, were able to infect guinea-pigs.

The fourth calf (No. 152) was killed 96 days after it was fed, and it was surprising to what a slight extent the disease had spread in that time, a few caseous foci only being seen in the coeliac glands and one tubercle in the liver and one in a portal gland.

COURSE OF INFECTION.

Out of twenty-three animals (one of the baboons is eliminated on account of the presence of natural tuberculosis) the tonsils were affected in three instances—twice in the pig and once in the baboon. The small intestines showed definite lesions in twelve cases, five being in calves, four in baboons and three in pigs (in a fourth pig there was a doubtful erosion).

In all the animals the glands in connection with the alimentary tract were tuberculous; in one of the six calves and in seven of the twelve pigs these glands were affected without evident disease of the alimentary mucous membrane; in every baboon there was a lesion at the site of entry of the bacillus.

The early appearance of lesions in the lungs and liver of young pigs fed with tuberculous material, and the numerical relationship of the lesions with the number of bacilli ingested, indicate that tubercle bacilli can pass through the mucous membrane of the alimentary tract and glands in connection with it and primarily infect distant organs.

The experiments with the pigs have clearly shown that in these animals the bronchial and portal glands became infected after the lungs and liver; in the calf the mediastinal glands may be tuberculous without evident disease in the lungs.

ANALYSIS OF THE POST-MORTEM RESULTS.

				Sites of Entry.		Nearest Glands.														Serous Surfaces.		
Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Tonsils.	Intestines.	Submaxillary Glands.	Pharyngeal Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Thoracic Glands.	Coeliac Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Diaphragm.	Peritoneum.	Pleura.	Outlying Lymphatic Glands.
Calf 150 - -	2 months	1,000,000	64 days -				✦															
Calf 156 - -	2 months	5,000,000	36 ,, -		✦				✦ and one gastric.	+												
Calf 146 - -	2 months	5,000,000	36 ,, -		✦				✦	+	+		G.P. from candal mediastinal gland died tuberculous.		No lesions visible. G.P. died of tuberculosis.							
Calf 154 - -	2 months	10,000,000	36 ,, -		✦				✦	+	+											+ Gluteal gland.
Calf 148 - -	2 months	1,000,000	98 ,, -		+					+		Doubtful nodules. G.P. remained healthy.	+									
Calf 152 - -	2 months	10,000,000	96 ,, -		✦				✦	+	+			+		+	+					
Baboon 2 - -	Young -	1,000,000	96 ,, -		✦				+			+	+		+	+			+	+		
Baboon 8 - -	Adult -	1,000,000	97 ,, -	✦		✦	✦	✦				+	+	+	✦	+		+	+	+	+	
*Baboon 4 - -	Young -	5,000,000	35 ,, -		+							✦	✦	+	+	?		?	✦		✦	
Baboon 10 - -	Adult -	5,000,000	36 ,, -		+		+		+						No lesions visible. G.P. became tuberculous.							
Baboon 6 - -	Young -	10,000,000	67 ,, -		+				✦			+	?		+	+						
Baboon 12 - -	Adult -	10,000,000	65 ,, -		+				✦			+	✦	✦	✦	+						

* Spontaneous tuberculosis.

NOTE.—The crosses with thick lines indicate severe infection.

				Sites of Entry.		Nearest Glands.															Serous Surfaces.		
Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Tonsils.	Intestines.	Submaxillary Glands.	Pharyngeal Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Mediastinal Glands.	Coeliac.	Spleen.	Liver.	Portal Glands.	Kidneys.	Diaphragm.	Peritoneum.	Pleura.	Outlying Lymphatic Glands.
Pig 18 - -	10 weeks -	1,000,000	39 days		+				+	+		+					+	+					
Pig 44 - -	9 months -	1,000,000	46 ,,			+					+												
Pig 24 - -	10 weeks -	5,000,000	38 ,,			✦ (right)	✦ (right)		+	+		✦	+ (Slight)			+	✦	+					
Pig 34 - -	7–8 months	5,000,000	46 ,,		?				✦	✦	+						+		?				
Pig 26 - -	10 weeks -	10,000,000	37 ,,		+	✦	✦		+	+	+	✦	+			+	✦	+	?				
Pig 40 - -	9 months -	10,000,000	45 ,,	+		✦			+		+	?											
Pig 30 - -	10 weeks -	1,000,000	103 ,,						+	+		✦			+	+	✦	✦		+	+		
Pig 38 - -	7–8 months	1,000,000	109 ,,						+	+		+ (Slight)	+		+		+	+					
Pig 22 - -	10 weeks -	5,000,000	111 ,,			✦	✦	+	+	+	+	✦	✦	+	✦	+	✦	✦		+	✦	+	
Pig 36 - -	7–8 months	5,000,000	115 ,,			✦		+	✦	✦	+	+	+		+		+	+		+			
Pig 20 - -	10 weeks -	10,000,000	115 ,,			✦	✦	+	✦	✦	✦	✦	✦	+	✦	✦	✦	✦	?	✦	✦	✦	+
Pig 42 - -	9 months -	10,000,000	117 ,,	+	+	✦	+		✦	✦	+	+	+	+	+	+	+	+		+	+	+	

NOTE.—The crosses with thick lines indicate severe infection.

DETAILED DESCRIPTION OF EXPERIMENTS.

CALF 156.

Age—2 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 15th, 1904.

Amount of Milk—27·94 cc.

Number of tubercle bacilli—5,000,000.

Killed—February 20th, 1904.

Duration of Experiment—36 days.

Clinical History.

The calf remained in good health throughout the experiment.

Temperature.

No marked rise. Highest temperature, 39·8° C. on twenty-fourth day.

Weights.

	cwt.	qr.	lbs.
January 19th, 1904 - - - -	1	0	14
February 16th, 1904 - - - -	1	1	15

Gain in weight.—1 qr. 1 lb.
Average weekly increase.—7·25 lbs.

Tuberculin Test.

February 19th, 1904. 31 days after the experiment began. Positive. Rise of temperature 1·70 C.

POST-MORTEM EXAMINATION.

Tongue, Pharynx.—Normal.

Tonsils.—Slightly congested. Otherwise normal.

Retropharyngeal Lymphatic Glands, Submaxillary Lymphatic Glands, Subparotid Lymphatic Glands.—Were free from visible tubercle.

Cervical Glands. Oesophageal Glands.—Normal.

Abdomen:

Omentum, Peritoneum.—Showed no evidence of tuberculosis.

Intestines.—The mucous membrane throughout the whole length of the small and large intestines was dotted with closely set petechial points of hæmorrhage; that in the colon also showed a large patch of congestion.

Small Intestines.—The interior of the small intestines showed a number of nodules, from 3 to 10 mm. across, the majority of which were ulcerated; these were more abundant in the duodenum and the jejunum than in the ileum, and occurred in the first part in almost every successive patch, and several were seen in the mucous membrane; in the ileum only here and there was the mucous membrane of a Peyer's patch affected, the long terminal Peyer's patch, although slightly swollen, showed no sign of ulceration or tuberculous deposit. From eighteen to twenty nodules were counted; five of these were submucous; ten occurred in five out of the first six patches.

The nodules were hyperæmic and slightly raised above the surface; most of them showed a minute central ulcer exposing a caseous central part, but in several the destruction of the mucous membrane was more complete, and irregular ulcers, up to 6 mm. in diameter, were formed, the edges and base of which were caseous. There were no subperitoneal tubercles, but the thickened bases here and there formed distinct elevations on the serous surface. Two Peyer's patches showed, in addition to nodules, very numerous minute yellow foci.

Large Intestine.—There was no ulceration or sign of tuberculosis in the cæcum, colon or rectum.

Glands:

As a result, probably, of the inoculation of tuberculin on the preceding day, all the abdominal lymph glands were greatly enlarged, hæmorrhagic and œdematous. Many glands, not ordinarily visible, on the surface of the stomach and in the mesocolon, stood out as conspicuous dark red objects.

There was an excess of fluid in the peritoneal cavity, and the serous surface of the small intestines was hyperæmic.

A gland lying on the mesenteric artery, near the pancreas, was indurated and showed a few caseous foci.

Gastric Glands.—A gland on the surface of the rumen, the size of a broad bean, was indurated and thickly beset with caseous foci.

Other gastric glands were free from tubercle.

Mesenteric Glands.—When removed from the intestines, the glands in the fore part of the mesentery were seen to be more extensively involved than those in any other part. The first seven glands were much enlarged (the largest 2 in. by 1¼ in. by ¾ in.) and uniformly hardened; the remaining glands with one exception, showed in some parts of their cortices nodular enlargements, up to 1·5 cm. or more in diameter. Fourteen or fifteen of such nodules were counted.

On section the glands and nodules showed moderately well advanced caseation, but there was still a fair amount of grey translucent tissue; the caseous areas were firm, greyish white, and very congested.

Ileo-Cæcal Glands.—A large ileo-cæcal gland contained a caseous nodule 1 cm. in diameter.

An ileo-colic gland showed a translucent tubercle, the size of a pin's head.

Other glands round the termination of the ileum were unaffected.

Colic Glands, Rectal Glands.—Were all free from tuberculosis.

Coeliac Glands.—Were unaffected.

Spleen, (10 ozs.) *Liver, Gall Bladder, Portal Glands, Kidneys.*—Showed no visible tubercles.

Suprarenal Bodies.—Normal.

Thorax:

Heart, Pericardium, Pleura, Diaphragm.—Normal.

Lungs.—The lungs showed throughout numerous petechial hæmorrhages, and on the surface several ecchymotic patches; no tubercles were seen.

Thoracic Glands.—The bronchial glands and the glands in the dorsal mediastinum were slightly enlarged, œdematous and hæmorrhagic.

The following glands were unaffected:—

Ischiatic, Gluteal, Popliteal, Precrural, Pudic, Iliac, Sacro-iliac, Lumbar, Prescapular, Prepectoral, Axillary.

At the seat of inoculation of tuberculin (thirty hours previously) on the left side there was a prominent œdematous swelling, 7 in. by 5 in. by 2 in., involving subcutaneous tissues, muscles and deep areolar tissues.

Left Prescapular Gland.—Measured 1½ in. by 1 in. by ½ in., and on section was very œdematous and hæmorrhagic.

Right Prescapular Gland.—1½ in. by ¼ in. by ⅓ in., was œdematous, and showed a few petechial points.

Testicles, Larynx, Trachea.—Normal.

Microscopical Examination.

Smears from :

Intestinal Ulcers :

(*a*) *Pus from Centre of Ulcer.*—Numerous tubercle bacilli.

(*b*) *Caseous Margin* (two films examined).—A few tubercle bacilli.

Gastric Gland } Tubercle bacilli
Gland on Mesenteric Artery } numerous.

Mesenteric Gland.—A few tubercle bacilli.

Ileo-Caecal Gland.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

ALL INTRAPERITONEALLY.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
852	130	E. of Spleen	Killed 58 days	Healthy.
853	150	E. of Mediastinal Gland	Killed 58 days	Healthy.
854	110	E. of Mesenteric Gland	Died 34 days	General Tuberculosis.
855	190	E. of Intestine	Died 27 days	General Tuberculosis.

CALF 146.

Age—2 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 12th, 1904.

Amount of Milk—315·2 cc.

Number of tubercle bacilli—5,000,000.

Killed—February 17th, 1904.

Duration of Experiment—36 days.

Clinical History.

The animal showed no signs of ill-health during the experiment.

Temperature.

The temperature rose on the 22nd day, and was high for 3 or 4 days (highest 40·2° C.); subsequently it was normal.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	1	0
February 16th, 1904 - - -	1	2	0

Gain in weight.—1 qr.

Average weekly gain.—7 lbs.

Tuberculin Test.

February 16th, 1904. 35 days after the experiment began. Positive. Rise of temperature 1·5° C.

POST-MORTEM EXAMINATION.

Tongue, Naso-Pharynx.—Normal.

Tonsils.—Congested; otherwise normal.

Post-Pharyngeal Glands.—Œdematous and slightly congested; showed no macroscopic evidence of tubercle.

Submaxillary Lymphatic Glands, Subparotid Lymphatic Glands.—Normal.

Cervical Glands.—On both sides normal.

Oesophageal Glands.—Normal.

Abdomen :

In the peritoneal cavity there was a small quantity of clear yellow fluid (30 to 40 cc.).

The parietal peritoneum was normal.

Omentum.—The omentum contained very little fat, and showed no visible tubercles.

The blood vessels on the serous surfaces of the small intestines were markedly dilated.

Small Intestine.—The mucous membrane throughout the whole length of the small intestine was congested; the congestion was chiefly noticeable on the summits of the valvulæ conniventes, and was greater in the duodenum and jejunum than the ileum; the margins of all the Peyer's patches were raised and congested.

In the first five feet of intestine the mucous membrane showed two minute yellow foci (a smear from one of these showed tubercle bacilli). The first Peyer's patch, seven feet from the pylorus, contained four yellow foci, one the size of a pin's head, the others just visible (two of these foci were examined; tubercle bacilli were found in one only).

Following this there were five patches; two of these were normal; three each contained two yellow foci similar to the above (tubercle bacilli were found in one focus). The yellow foci were softened, and occurred near the surface of the patch.

About twenty-six feet from the pylorus a Peyer's patch showed one yellow focus and a minute ulcer.

From this point onwards all the Peyer's patches, with five exceptions, showed small ulcers; the ulcers were situated in the centres of slightly raised indurated rounded areas from 6 to 8 mm. in diameter; the mucous membrane surrounding the ulcers was deeply congested. The ulcers in most cases were merely minute superficial erosions exposing greenish white necrotic substance, but some, and these in the ileum, were circular, 2 to 3 mm. in diameter, and involved the whole thickness of the patch; the latter were filled with soft yellow pus.

On section through the indurated areas the lymphoid tissue beneath the mucous membrane was seen to be in a state of caseation.

There were no subperitoneal tubercles or thickening of the muscle wall, but the serous coat opposite some of the ulcers was slightly roughened.

Two or three of the patches in the ileum showed in the neighbourhood of the ulcers numerous discrete caseous foci, and two patches each contained a caseous nodule which had not ulcerated. There were altogether twenty-four nodules that had ulcerated and two that had not, besides numerous caseous foci; the nodules were contained in fourteen patches, the long terminal one containing ten, nine close together at the anterior end, and one three inches from the ileo-cæcal valve; near the latter there were a few minute yellow foci.

Large Intestine.—The mucous membrane of the caecum and colon was congested; eighteen inches from the ileo-cæcal valve the colon showed two nodules, the largest about the size of a pea, containing soft greenish material (no tubercle bacilli were found—probably parasitic).

There was no sign of ulceration in any part of the large intestine.

Gastric Glands.—All the gastric glands appeared enlarged: on section they were œdematous, but showed no tuberculosis.

The coeliac glands, and glands in close contact with the pancreas, were œdematous, but free from visible tubercle.

Mesenteric Glands.—With the exception of three glands in the anterior part of the mesentery, and two a little further along, which were unaffected, all the mesenteric glands contained in their cortices firm rounded nodules, ranging in size from 6 to 8 mm. up to 1·5 cm. in diameter. There were in all about twenty-four nodules. They caused on one side of the mesentery marked projections, over which the serous coat was very congested. When cut into, the majority of the nodules were seen to be extensively caseated, those in the anterior part being less advanced, and showing more grey translucent tissue than those in the posterior; the caseous areas were not softened or appreciably calcareous. The large terminal gland of the series contained two nodules and several scattered foci.

Ileo-colic Glands.—A large gland (1½ in. by ¾ in. by ½ in.) in contact with the ileum, 2 or 3 in. from the ileo-cæcal valve, was thickly beset with caseous foci; a second gland, about half the above size, lying on the opposite side of the ileum at its junction with the cæcum, contained a moderate number of caseous foci in the cortex.

Colic Glands.—The first few glands in connection with the colon appeared normal. Eighteen inches from the ileo-cæcal valve there was a gland the size of a large pea, which was tuberculous throughout; 4½ ft. onwards a colic gland showed a little collection of caseous foci in one part of the cortex; other colic glands appeared normal.

Rectal Glands.—Normal.

Spleen, Kidneys, Suprarenal Bodies, Liver, Gall Bladder, Portal Glands.—Everywhere normal in appearance.

Lungs.—The surfaces of both lungs were spotted all over with minute petechial hæmorrhages; similar points were seen on section; there were no visible tubercles. The anterior lobe of the right lung showed some small patches of collapse.

Mediastinal Glands and Bronchial Glands.—Were intensely congested and œdematous, but showed no sign of tuberculosis.

The left bronchial gland was much more œdematous than the right.

Peribronchial Glands, Ventral Mediastinal Glands, Vertebral Glands, Visceral Pleura, Parietal Pleura, Heart, Pericardium.—Normal.

The following glands showed no evidence of tuberculosis:—

Ischiatic, Gluteal, Popliteal, Precrural, Pudic, Iliac, Sacro-iliac, Lumbar, Axillary, Prepectoral, Prescapular.

At the seat of inoculation of tuberculin (eighteen hours previously) there was a prominent swelling, 5 in. by 3 in. When incised it was seen to be an inch and a half thick, and to be produced by an œdematous infiltration of the subcutaneous tissues, muscles and deep areolar tissues.

Left Prescapular Gland.—Measured 2 in. by 1 in. by (nearly 1 in.) and was on section œdematous and hæmorrhagic.

Right Prescapular.—2 in. by 1 in. by ¼ in.—Normal.

Larynx, Trachea, Thyroid, Thymus, Testicles.—Normal.

Microscopical Examination.

Smears from:

Five Foci in Duodenum.—Tubercle bacilli in two.

Two Ulcerating Intestine Nodules.—Tubercle bacilli in both.

Mesenteric Gland.—Tubercle bacilli very numerous.

Colic Gland.—Tubercle bacilli numerous.

Gland on Pancreas.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

All Intraperitoneally.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
841	170	E. of Mesenteric Gland	Died 12 days	Tuberculosis.
842	160	E. of Spleen	Died 59 days	General Tuberculosis.
843	160	E. of Mediastinal Gland	Died 62 days	General Tuberculosis.
844	140	E. of Intestine	Died 12 days	Tuberculosis.
845	110	Peritoneal Fluid	Killed 84 days	Healthy.

CALF 154.

Age—2 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 15th, 1904.

Amount of Milk—55·88 cc.

Number of tubercle bacilli—10,000,000.

Killed—February 20th, 1904.

Duration of Experiment—36 days.

Clinical History.

The calf remained in good health during the experiment.

Temperature.

Slight rise on the 17th day, then normal; temperature again raised in fourth week, reaching 40·5° C. on 24th day.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	0	24
February 16th, 1904 - - -	1	1	22

Gain in weight.—26 lbs.

Average gain per week.—6·5 lbs.

Tuberculin Test.

February 19th, 1904. 35 days after experiment began. Positive. Rise of temperature, 2·4° C.

POST-MORTEM EXAMINATION.

Tongue, Septum Nasi, Pharynx, Tonsils.—Normal.

Retro-Pharyngeal Glands.—Œdematous; otherwise normal.

Submaxillary Lymphatic Glands, Subparotid Lymphatic Glands, Cervical Glands, Oesophageal Glands.—Normal.

Abdomen.—

There was an excess of fluid in the peritoneal cavity; the serous surface of the small intestine was slightly hyperæmic.

Omentum.—The omentum showed no evidence of tuberculosis.

The Parietal Peritoneum was normal.

Small Intestine.—The mucous membrane was slightly congested. One foot from the pylorus the mucous membrane showed a flattened caseous nodule, in the centre of which there was a minute ulcer; a lymphatic gland in close proximity was tuberculous. Similar nodules were scattered throughout the whole length of the small intestine; there were altogether twenty-eight nodules, eight or nine of which occurred in the mucous membrane, the rest in Peyer's patches; all except three were ulcerated. The ulcers were situated in the centres of the nodules, and were mostly minute erosions, exposing a caseous floor, but one or two in the ileum were moderately large, had irregular margins, and were filled with yellow pus. The nodules were slightly raised above the surface, and were congested; they varied in size from 3 or 4 up to 6 mm. in diameter, but were usually about 5 mm.; they were more numerous in the duodenum than in the jejunum or ileum. Section through a nodule showed a caseous centre; the muscle wall was not apparently infiltrated, and there were no subperitoneal tubercles, but the site of a nodule was marked on the external surface of the gut by a reddish discolouration.

Two or three of the affected Peyer's patches showed caseous foci, as well as nodules; others caseous foci only. Thirteen patches were affected; twenty appeared normal; the long patch in the ileum showed one large irregular ulcer and three small ones at the anterior end. Two or three inches from the ileo-cæcal valve there was a small ulcer in the mucous membrane.

Large Intestine.—In the upper part of the colon there were two slightly raised congested nodules, one 8 mm., the other 5 mm. in diameter; both were ulcerated, the ulcers being filled with yellowish pus. On section the nodules were caseous in the centre. A little distance from the large nodule there was a subperitoneal tubercle, the size of a mustard seed.

A small nodule with a minute ulcer was seen in the cæcum, and a similar one in the colon near the ileo-cæcal valve.

Lymphatic Glands.—All the abdominal lymph glands, apart from those obviously tuberculous, were enlarged and œdematous.

The gastric glands and cœliac glands showed no sign of tubercle.

A gland lying along the mesenteric artery near the pancreas showed a number of caseous foci in the cortex (a smear showed tubercle bacilli).

One of the series of small glands in connection with the first few feet of the duodenum was tuberculous throughout (*see* duodenum).

Mesenteric Glands.—The mesentery, when separated from the intestines, had at the anterior end two large indurated glands, which on section showed throughout a network of firm caseous tissue in a greyish translucent matrix. (These glands lay between the duodenum and large intestine.)

The above were followed by two small glands, one of which contained a few caseous foci.

From this point the great majority of the mesenteric glands showed in some part of their substance hard nodular enlargements, over which the mesentery was congested. Twenty-four to twenty-six nodules were counted. They ranged in size from 5 mm. in diameter to 2 cm. by 1 cm., but were generally about 1 cm. across; they were situated in the cortex, were irregular in outline and not definitely circumscribed; the cut surface showed grey translucent tissue closely beset with caseous foci, which in some of the nodules were confluent. The nodules were rather more numerous in the anterior than the posterior half of the mesentery. Besides the nodules a few of the glands contained caseous foci.

The large terminal gland contained two nodules 5 mm. in diameter, and several yellow foci.

Ileo-colic Glands.—A large gland closely applied to the ileum, near the ileo-cæcal valve, showed two caseous masses, each about 1 cm. in diameter, and numerous foci; a small gland near this in the meso-cæcum was closely beset with caseous foci. Four glands, ranging in size from a kidney to a broad-bean, in the upper part of the meso-colon, were affected; one contained several translucent points; the others small caseating masses and caseous foci.

Colic Glands.—A colic gland two feet from the cæcal valve showed numerous caseous foci; three mid-colic glands contained caseating nodules.

Other colic glands and the rectal glands were unaffected.

Spleen.—9 ozs. Showed no naked eye evidence of tuberculosis.

Kidneys, Suprarenal Bodies, Liver, Gall Bladder, Hepatic Lymphatic Glands.—Showed no naked eye evidence of tuberculosis.

Thorax:

Lungs.—The lungs were speckled all over with numbers of hæmorrhagic points; many lobules were mapped out by effusions of blood in the interlobular septa; on the surface and on section there were no visible tubercles.

Thoracic Glands.—The mediastinal and bronchial glands were hæmorrhagic (dark red throughout) and œdematous; they showed no sign of tuberculosis.

Heart, Pericardium, Pleura.—Normal.

Lymphatic Glands:

Right Gluteal.—Showed in the cortex a caseous nodule 3 or 4 mm in diameter. (Numerous tubercle bacilli were found.)

The following glands were free from visible tubercles:—

Ischiatic, Left Gluteal, Popliteal, Precrural, Pudic, Iliac, Sacro-iliac, Lumbar, Prescapular, Prepectoral, Axillary.

At the seat of inoculation of tuberculin (26 hours previously) on the left side of the neck there was an œdematous swelling 5 in. by 4 in. by 1 in.

Left Prescapular.—1½ in. by 1¼ in. by (over) ½ in. On section œdematous and intensely hæmorrhagic.

Right Prescapular.—1¾ in. by ¾ in. by ¼ in. Normal on section.

Larynx, Trachea, Thyroid, Thymus, Testicles.—Normal.

Microscopical Examination (Smear preparations).

Mesenteric Gland *The Gland Lying on the Mesenteric Artery*	Tubercle bacilli found.
Mediastinal Gland, *Intestinal Nodule (Emulsion for G. P.'s.)*	No tubercle bacilli.

Intestinal Nodule from Mucous Membrane.—One (?) tubercle bacillus seen.

Small Ulcer in Cœcum, *Ulcerated Nodule in Colon,*	Tubercle bacilli found.

Colic Gland.—No tubercle bacilli.

Gluteal Gland.—Numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

All Intraperitoneally.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
848	140	E. of Spleen	Killed 58 days	Healthy.
849	130	E. of Mesenteric Gland	Died 20 days	General Tuberculosis.
850	135	E. of Mediastinal Gland	Killed 58 days	Healthy.
851	100	E. of Intestine	Died 3 days	No macroscopic evidence of tuberculosis; scraping from peritoneum showed tubercle bacilli.

CALF 150.

Age—2 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 15th, 1904.

Amount of Milk—5·58 c.c.

Number of tubercle bacilli—1,000,000.

Killed—March 19th, 1905.

Duration of Experiment—64 days.

Clinical History.

There were no signs of illness during the experiment.

Temperature.

The temperature rose to 40·9° C. on 11th day after the experiment began, but quickly fell, and with the exception of a second temporary rise to 39·9°C. on March 7th remained normal till death.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - - -	1	0	0
March 3rd, 1904 - - - -	1	1	25

Gain in weight.—1 qr. 25 lbs.
Rate of gain per week.—6·62 lbs.

Tuberculin Test.

March 14th, 1904. 59 days after the experiment began. Positive. Rise of temperature 1·9° C.

POST MORTEM EXAMINATION.

Condition.—Good.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal Lymphatic Glands.—On the left side one gland was much enlarged, measuring about 2 in. by 1½ in. by 1in. On section its tissue was found to be grey, but closely beset with yellow streaks and points of caseation.

Several other pharyngeal glands on this side were a little larger than the opposite ones, but otherwise appeared normal.

Glands on the right side normal.

Parotideal Lymphatic Glands, Small Intestine, Large Intestine, Mesenteric Glands.—Normal.

Ileo-Colic Glands.—Three ileo-colic glands were somewhat enlarged; on section they were normal.

Pleura.—Normal.

Lungs.—Save that a few lobules were collapsed, the lungs were normal.

Heart.—Normal.

Pericardium.—Contained about 10 c.c. of clear fluid.

Thoracic Lymphatic Glands.—Normal.

Omentum and Peritoneum.—Peritoneal cavity contained about 3 c.c. of clear fluid.

Liver.—Normal, with the exception of one speck, just macroscopic, under the capsule. (C.G.P. No tubercle bacilli.)

Hepatic Lymphatic Glands, Spleen, Kidneys.—Normal.

Various Lymphatic Glands :

Right Prescapular.—Normal.

Left Prescapular.—Was double the normal size and was distinctly œdematous. (Recent tuberculin inoculation on this side.)

Axillary, Superficial Inguinal, Popliteal, Precrural, Ischiatic, Lumbar, Iliac.—Normal.

Microscopical Examination.

Mesenteric Gland. } No tubercle bacilli.
Speck from Liver }

GUINEA-PIGS INOCULATED.

GUINEA-PIG 890 WAS INOCULATED SUBCUTANEOUSLY.

OTHER GUINEA-PIGS WERE INOCULATED INTRAPERITONEALLY.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
888	200	Peritoneal Fluid	Killed 69 days	Healthy.
889	150	Emulsion of Spleen	Died 2 days	Acute infection.
890	180	E. of Colic Gland	Killed 69 days	Healthy.
891	230	E. of Colic Gland		
892	220	E. of Left Posterior Pharyngeal Gland	Died 35 days	General Tuberculosis.

CALF 148.

Age—2 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 15th, 1904.

Amount of Milk—5·58 c.c.

Number of tubercle bacilli—1,000,000.

Killed—April 22nd, 1904.

Duration of Experiment—98 days.

Clinical History.

There were no signs of ill-health during the experiment.

Temperature.

Fairly uniform throughout, never rising above 39·6°C.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	2	4
April 19th, 1904 - - -	2	2	17

Gain in Weight.—1 cwt. 13 lbs.

Average weekly increase.—9·61 lbs.

Tuberculin Test.

April 15th, 1904. 91 days after the experiment began. Positive. Rise of temperature, 1·8°C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Subparotid Lymphatic Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestine.—About the middle of the jejunum a Peyer's patch contained a firm spherical nodule, the size of a large pea ; on section it was composed of grey translucent tissue resembling gland tissue ; in the centre there was a minute yellow point ; the mucous membrane over the nodule was intact.

In the early part of the ileum there was a similar but smaller submucous nodule.

The long terminal patch was normal.

All the Peyer's patches were somewhat swollen.

Large Intestine.—In the colon, a few inches from the valve, there was a submucous nodule, the size of a split pea, containing yellow, softened, gritty foci ; the mucous membrane over it was slightly congested, but not ulcerated. Elsewhere the large intestine was normal.

Lymphatic Glands :

The gastric, cœliac, and pancreatic glands were normal.

All the mesenteric glands were normal.

Ileo-cœcal gland normal.

In the angle between the ileum and the colon there was a group of four glands ; one was greatly enlarged, measuring 2 in. by 1½ in. by 1¼ in., and was practically caseo-calcareous throughout ; a second showed a number of yellow gritty foci in the cortex ; the other two were normal.

The glands between the folds of the large intestine, and the rectal glands, were congested and larger than normal, but showed no evidence of tubercle.

Spleen.—18 ozs. Normal.

Liver.—Normal on the surface and on section.

Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—In the middle of the thin sternal border of the right cephalic lobe there was a group of twelve to fifteen nodules, ranging in size from 2 to 5 mm. in diameter ; they were all arranged closely together (except one which was a little distance apart); some formed projections beneath the pleura on the external, others on the internal surface. On section they had a homogeneous grey translucent appearance, and showed no sign of caseation or calcification (they were not apparently of a tuberculous nature). There was a large patch of collapse in the right middle lobe, and several smaller ones in the cephalic lobes, with these exceptions the rest of the lung was normal.

Thoracic Glands—The caudal mediastinal gland showed a minute gritty yellow focus in the cortex.

The gland anterior to this contained two nodules 2 mm. in diameter, yellow and gritty in the centre.

Other mediastinal and the bronchial glands were normal.

Pleura: The pleura and pleural surface of the diaphragm were normal.

The subcutaneous tissues at the site of inoculation of tuberculin on the right side of the neck were slightly œdematous and congested.

Right Prescapular Gland.—Measured 2½ in. by 1⅛ in. by ¾ in., and on section was very œdematous and slightly congested.

Left Prescapular Gland.—Measured 2 in. by ¾ in. by ⅔ in., and was slightly œdematous.

With the exception that several glands were juicier than usual, all the lymphatic glands not mentioned above were normal.

Microscopical Examination.

Smears from :

Ileo-Colic Gland (Emulsion).—Tubercle bacilli.

Mediastinal Gland.—One tubercle bacilli.

Intestinal Nodule (small) -	No tubercle bacilli.
Nodule in Colon - -	
Lung - - - -	

GUINEA-PIGS INOCULATED.

GUINEA-PIG 961 WAS INOCULATED INTRAPERITONEALLY, THE REST SUBCUTANEOUSLY.

Number of Guinea-pig.	Weight in grammes.	Materials Inoculated.	Duration of Life.	Result.
957	250	Peritoneal Fluid	Killed 49 days	Healthy.
958	250	E. of Spleen	Killed 49 days	Healthy.
959	200	E. of Lung	Killed 49 days	Healthy.
960	200	E. of Ileo-Colic Gland	Died 9 days	No Tuberculosis (acute infection.)
961	220		Died 26 days	General Tuberculosis.

CALF 152.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 15th, 1904.

Amount of Milk—55·88 c.c.

Number of tubercle bacilli—10,000,000.

Killed—April 20th, 1904.

Duration of Experiment—96 days.

Clinical History.

There were no signs of ill health during the experiment.

Temperature.

The temperature during the first 7 weeks, with the exception of a slight rise on the 8th day (to 39·6°C.) and one on the 41st day (to 39·8°C.), varied between 38·5° and 39·4°C.: on the 52nd day there was a sharp rise to 40·5°C.: subsequently the temperature remained normal throughout.

Weights.

	cwt.	qrs.	lbs.
January, 19th, 1904 - - - -	1	1	10
April 19th, 1904 - - - - -	2	0	22

Gain in weight.—3 qrs. 12 lbs.

Average weekly increase.—7·38 lbs.

Tuberculin Test.

April 15th.—91 days after the experiment began. Positive. Rise of temperature 1·3°C.

POST-MORTEM EXAMINATION.

Carcass.—In fair condition.

Tongue, Tonsils, and Pharynx.—Normal.

Retropharyngeal, Submaxillary, and Parotid Lymphatic Glands.—Normal.

Cervical Glands.—Normal.

Abdomen :

There was a small amount of serous fluid in the peritoneal cavity.

The omentum and parietal peritoneum were normal.

A gland in the middle of the omentum, the size of a pea, contained a caseo-calcareous nodule 2 mm. in diameter.

The surface of the stomach and the gastric glands were normal.

Small Intestine.—The first fifteen feet of the small intestines were healthy. Six Peyer's patches in the next twenty-five to thirty feet showed yellow softened foci, one patch containing four, the others one and two. In the rest of the intestine there were altogether twenty-three nodules ranging in size from 5 to 8 mm. in diameter, besides numerous foci. Seventeen of the nodules occurred in Peyer's patches; six were submucous. The terminal Peyer's patch (9 ft. in length) contained twelve nodules; these occurred principally at the anterior end. The nodules projected slightly above the surface, and were somewhat flattened. The mucous membrane over the majority showed a minute central opening: in others there was a slight depression, not apparently involving the whole thickness of the membrane. On section the nodules were caseous in the centre, and in many cases contained calcareous grains Three of the nodules were made up of an aggregation of yellow gritty tubercles, each the size of a pin's head. The small foci all occurred in Peyer's patches: many were on the surface, and could be readily picked out on the end of a scalpel from a cup-shaped depression; others were more deeply placed in the substance of the patch.

The serous surface of the intestine was normal.

Large Intestine.—Beneath the mucous membrane of the cæcum, near the valve, there were two congested nodules, the size of a No. 1 shot; one showed on section caseous foci; the other was caseous and softened; a third nodule, some distance from the above, similar in size, contained gritty foci.

In the colon, about a foot from the valve, there was a submucous nodule the size of a large pea, filled with soft caseo-pus; near this there were two nodules, half the size, caseous and beginning to soften. Some distance further on there was a small pea-sized nodule filled with caseo-pus.

Mesenteric Glands.—The glands in the anterior quarter of the mesentery were but slightly affected; in all only three small caseo-calcareous masses were seen. The glands in the remainder of the mesentery without exception showed in some part of their cortices tuberculous nodules; nearly thirty separate nodules were counted. They ranged in size from a few millimetres up to about two centimetres in length. On section they were irregular in outline and not definitely circumscribed; they were caseous, and showed varying amounts of calcareous deposit.

The two terminal mesenteric glands (one on each side of the mesentery) were practically tuberculous throughout, being very closely beset with caseo-calcareous masses.

The ileo-cæcal gland was enlarged, and contained about half a dozen irregular caseo-calcareous masses from 2 to 3 mm. up to 1 cm. in diameter; the cortex also contained scattered yellow gritty foci.

Colic Glands.—In the meso-colon, a few inches from the termination of the ileum, there was a group of three glands; two were the size of walnuts, the third was much smaller. The two large glands contained scattered throughout their cortices caseo-calcareous masses and calcareous foci; the small gland showed one nodule 1 cm. in diameter; the tuberculous masses in these glands were congested. About a foot further along there was a large gland which contained a caseo-calcareous nodule 1 cm. in diameter. Two small glands in the midst of the coils of the large intestine contained tuberculous nodules, and one gland, the size of a broad bean, showed two or three masses and a few scattered foci.

Rectal Glands.—Normal.

Cœliac Glands. (four in number).—The largest showed at one extremity numerous yellow foci, appreciably gritty; a small gland contained one similar focus; the other two glands were normal.

Spleen.—11 ozs. Normal on surface and on section.

Liver.—Normal on the surface; contained in the depth a whitish spherical tubercle, the size of a pin's head (tubercle bacilli found).

Portal Glands.—One gland showed in the cortex a minute yellow point; all the others were normal.

Gall Bladder.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Pancreatic Glands.—All the small glands around the pancreas were normal.

Iliac, Lumbar and Renal Glands.—Were free from tubercles, but were œdematous and deeply congested.

Thorax:

Heart and Pericardium.—Normal.

Lungs.—No sign of tubercle either on the surface or on section. The tissue of the lungs showed numerous petechial hæmorrhages.

Thoracic Lymphatic Glands.—Showed no tubercle.

Mammary Gland and Supramammary Lymphatic Glands.—Normal.

The following lymphatic glands showed no macroscopic evidence of tubercle:

Prescapular, Prepectoral, Axillary, Precrural, Popliteal, Gluteal and Ischiatic.

Most of the lymphatic glands in the body, whether tuberculous or not, were œdematous and congested.

Right Prescapular Gland.—Measured 2⅓ in. by 1⅓ in. by 1 in.

Left Prescapular Gland.—Measured 1¾ in. by 1 in. by ¾ in.

Both were very œdematous and showed petechial hæmorrhages.

At the seat of inoculation of tuberculin on the right side of the neck there was an œdematous swelling 5 in. by 3 in.

Microscopical Examination.

Smears from:

The Omental Gland.—No tubercle bacilli.

Liver.—Twelve tubercle bacilli.

Portal Gland.—No tubercle bacilli.

Cœliac Gland.—Three tubercle bacilli.

Mesenteric Gland (caseous).—Numerous tubercle bacilli.

Emulsion of Mesenteric Glands.—No tubercle bacilli.

Foci in Intestines (three).—No tubercle bacilli.

Nodule in Small Intestine.—No tubercle bacilli.

Nodule in Cæcum.—No tubercle bacilli.

Nodule in Colon (1).—No tubercle bacilli.

Nodule in Colon (2).—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

GUINEA-PIG 955 WAS INOCULATED INTRAPERITONEALLY, THE REST SUBCUTANEOUSLY.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
953	280	E. of Spleen	Killed 51 days	Healthy.
954	230	Peritoneal Fluid	Killed 51 days	Healthy.
955	300	E. of Mesenteric Gland	Died 24 days	Tuberculosis.
956	230		Died 31 days	General Tuberculosis.

BABOON 2. (Young.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—1·85 c.c.

Number of tubercle bacilli—1,000,000.

Killed—When very ill; April 27th, 1904.

Duration of Experiment—96 days.

Clinical History.

During the last two or three weeks of life the baboon gradually fell into a condition of marasmus, becoming greatly emaciated and finally collapsed. When chloroformed it was practically moribund. The wasting was due, no doubt, to a large extent, to the large mass in the mesentery which must have seriously interfered with nutrition.

Temperature.

Normal during first six weeks; then for six weeks a period of irregular pyrexia, the temperature being usually higher in the evening than in the morning (highest point 40·1°C.); from the end of the tenth week until death the temperature gradually fell, and on several mornings could not be registered on the ordinary clinical thermometer; immediately after death a thermometer placed in the abdomen near the liver registered 30°C.

Tuberculin Tests.

February 25th, 1904. 34 days after feeding. Negative.
April 18th. 86 days after feeding. Negative.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Tongue, Tonsils, Pharynx, Retropharyngeal Glands, Submaxillary Glands, Buccal Lymphatic Glands, Superficial and deep Cervical Glands.—Normal.

Abdomen:

The peritoneal cavity contained a small amount of turbid serous fluid.

The parietal peritoneum was covered with very numerous hemispherical tubercles ranging in size from a mere point up to 1·5 mm. in diameter; the smaller tubercles were pearly grey, the larger ones slightly opaque in the centre; they were most abundant in the left flank and on the anterior wall.

Omentum.—The omentum was thickly studded with similar tubercles. When the omentum was floated out in water, these were seen to be connected with minute vessels. Towards the lower border of the omentum there was a gland the size of a pea, which was caseous throughout and softened in the centre. In the omentum, near the pylorus, a small gland showed a whitish softened focus.

Gastric Glands.—Several small glands along the great curvature of the stomach and others in the small omentum appeared normal.

Mesentery and Mesenteric Glands.—In the lower part of the mesentery, lying between the first part of the ascending colon and the ileum, there was an irregular mass measuring roughly $2\frac{1}{2}$ in. by 2 in. in superficial area and from $\frac{1}{2}$ inch to $\frac{1}{4}$ inch in thickness. The mass extended in one direction to the margin of the mesentery, and spread to a slight extent over each surface of the gut. Between seven and eight inches of intestine, situated some two feet above the ileo-cæcal valve, were thus involved.

The infiltrated mesentery was rigid, highly convoluted, and about half an inch in thickness.

The surfaces of the mass were smooth and white, presenting over the central proportions rounded eminences which gave a sense of fluctuation.

On section the body of the mass was found to consist of a number of nodules (enlarged mesenteric glands), one over an inch in diameter, surrounded by dense white fibroid tissue, which in places was almost cicatricial in density; the glands were caseous and irregularly softened, the largest one containing a quantity of creamy caseo-pus.

The thickened mesentery was composed of pale firm tissue beset with yellow caseous and softened nodules, each about the size of a shot.

Between the layers of the mesentery, around the periphery of the mass, there were numerous small glands; one of these contained a small caseous nodule; the rest were free from naked eye evidence of tuberculosis.

The mesentery of the lower 2 ft. of small intestine was not infiltrated, but showed numerous thickened lymphatic vessels, and near the bowel several enlarged and œdematous glands which, when cut into, collapsed, discharging clear fluid; the latter showed no foci of tubercle.

The ileo-colic glands were enlarged and distended with fluid, but were not visibly tuberculous.

All the numerous small glands in the mesocolon were normal.

Stomach.—The mucous membrane of the stomach showed three recent linear hæmorrhagic erosions.

Small Intestine.—The loop of intestine corresponding to that segment of the mesentery which was infiltrated was uniformly thickened, fleshy and œdematous; it was pinkish in colour, and showed on the surface numerous pearly tubercles from 1 to 2 mm. in diameter. Beneath the serosa there was a close network of transparent lymphatic vessels distended with fluid. Radiating from the mesenteric border over the surface of this portion of gut there were numerous white tortuous cords (lymphatic vessels ?); at first these were thick and closely arranged, but towards the convexity they were finer and more sparsely distributed; the cords showed here and there nodular thickenings, some of which contained yellow foci. Similar irregularly thickened lymphatics were seen on the surface of the intestine for several inches further along, also a few tubercles.

The walls of the lower 2 ft. of small intestine were much thicker than normal; the subserous lymphatic vessels were greatly distended, especially in the last few inches.

The interior of the upper part of the small intestine was normal.

The mucous membrane along the line of attachment of the thickened mesentery showed a series of small irregular ulcers; the edges of the ulcers were congested; the bases were formed by the growth in the mesentery, which here infiltrated the muscle wall of the intestine.

On the opposite side of the intestine there was an oval ulcer $\frac{1}{2}$ in. by $\frac{1}{4}$ in.; the margins of the ulcer were congested, slightly thickened and undermined; the floor was yellow, the base fibroid.

On the serous surface the position of this was marked by an oval area of whitish cicatricial tissue corresponding in size to the ulcer, and causing a slight constriction of the bowel; embedded in the fibrous patch there were one or two yellow foci; from the margins several slender white processes radiated over the serous surface.

The mucous membrane of the ileo-cæcal valve was congested and œdematous.

Large Intestine.—The large intestine was normal.

Spleen.—The spleen was slightly enlarged. On the surface there were numerous grey translucent tubercles similar to those on the peritoneum. The pulp contained from twenty to thirty yellow nodules ranging in size from a small shot to a large pea; many caused projections on the surface: the nodules were thin-walled, and contained a soft yellowish material resembling muco-pus. At the lower extremity, forming a marked projection to which the omentum was adherent, there was in addition to the above a large nodule ½ in. in diameter; on section it consisted of irregularly softened caseous substance showing here and there recent hæmorrhages.

A gland in the hilum of the spleen contained two yellowish white softened nodules the size of a large shot.

Several small glands near this, and others along the splenic vessels, were normal.

Liver.—A few miliary tubercles were seen on the surface of the suspensory ligament, none on the surface of the liver. Scattered throughout the substance there were moderately numerous greyish white spherical tubercles, ranging in size from 0·5 to 1·5 mm. in diameter.

Portal Gland.—Normal.

Kidneys.—Substance pale; no macroscopic tubercles.

Suprarenal Bodies.—Normal.

A cœliac gland, the size of a French bean, contained a number of minute greyish white foci.

In the right lumbar region, behind the renal vessels, there was a glandular mass a little over an inch in length and half an inch in diameter; on section the mass was found to consist of three glands which had fused together; all three glands were entirely destroyed by caseation.

On the left side there was one small gland with a minute caseous focus.

Thorax :

Heart, Pericardium, Parietal Pleura.—Normal.

Lungs.—The bases of both lungs were adherent by slender fibrous bands to the diaphragm; the left apex was slightly adherent to the chest wall.

The lungs contained numerous nodules, pretty evenly distributed, ranging in size from a mustard seed to a large pea; the majority lay near the surface, many projecting considerably; the larger nodules were firm, yellowish white in colour, with a narrow dark translucent periphery; on section they were caseous and beginning to soften; the smallest nodules were dark grey and translucent.

In the middle of the left lower lobe there was a large nodule, three-quarters of an inch in diameter; on section it was entirely caseous and irregularly softened.

Thoracic Glands.—At the root of the left lung, one above, the other below the bronchus, there were two glands, each about half an inch in diameter, which on section were seen to be filled with soft whitish caseo-pus. On the right side a gland showed a minute yellowish white focus.

On both sides there were besides numerous small darkly pigmented glands, which appeared normal.

In the posterior mediastinum, lying close together on the lower dorsal vertebræ, there were three glands, the smallest the size of a pea, the largest the size of a hazel nut; the small one contained caseous foci; the other two were yellowish, caseous throughout, and softened.

Diaphragm.—On the pleural surface along the margin of the central tendon there were some delicate connective tissue processes at the bases of which there were little clusters of grey miliary tubercles.

The peritoneal surface showed scattered miliary foci.

Iliac Glands, Inguinal Glands, Axillary Glands, Brain, Meninges, Uterus.—Normal.

Microscopical Examination.

Smears from :

Emulsion of Spleen *Pyloric Gland* *Peritoneal Fluid*	No tubercle bacilli.

Emulsion of Mesenteric Gland.—Four tubercle bacilli.

Liver.—No tubercle bacilli.

Guinea-pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from the mesenteric glands died in 3 days of an acute infection.

A guinea-pig inoculated subcutaneously with an emulsion from the spleen died in 43 days of general tuberculosis.

A guinea-pig inoculated subcutaneously with 2·0 c.c. peritoneal fluid died in 140 days of general tuberculosis.

Cultures were sown from the mesenteric glands and the majority of the tubes became contaminated; the results in the guinea-pigs also showed that the mesenteric glands had become secondarily infected by organisms which had passed in probably through the ulcerated intestinal mucous membrane.

BABOON 8 (Adult.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—1·85 c.c.

Number of tubercle bacilli—1,000,000.

Killed—April 28th, 1904.

Duration of Experiment—96 days.

Clinical History.

When killed the baboon was ill, though not seriously, and had apparently lost flesh. There was no increase in the rate of respiration.

Temperature.

Except for a slight rise on the 16th day to 38·9°C.; and on the 31st day to 39·0°C., the temperature during the first six weeks was fairly normal. During the seventh and eighth weeks the morning temperature was slightly raised, and from the eighth week till death, when the temperature was taken night and morning, the type of pyrexia was irregularly remittent, the highest evening temperature being 40·8°C.

Tuberculin Test.

April 18th, 1904, 86 days after the experiment began. No febrile reaction (temperature 40·6°C. just previous to inoculation); marked local reaction.

POST MORTEM EXAMINATION.

Body.—Somewhat emaciated.

The nasal cavities contained a small quantity of greenish yellow-muco-pus; the mucous membrane was congested, but showed no tubercle.

The mucous membrane along the free margin of the soft palate and that covering the arytænoid cartilages was pale and very œdematous, that on the palate showing a few yellow foci.

Tonsils.—On the right tonsil there was a deep ulcer half an inch long and three-tenths of an inch broad ; the margins were irregular and undermined ; the floor was ragged ; on cutting through the base of the ulcer the substance of the tonsil was seen to be infiltrated with caseous deposit, the caseous infiltration apparently extending into the tissues around.

On the left tonsil there was a similar but smaller ulcer, and the substance of the tonsil was infiltrated to a less extent.

Pharynx.—Many of the lymphoid follicles at the base of the tongue were enlarged and in a state of caseation ; on the right side caseous nodules were seen on the lateral wall of the pharynx posterior to the soft palate ; over one or two of these nodules there was a small opening in the mucous membrane suggesting beginning ulceration.

In the mucous membrane of the epiglottis on the right side, freely movable over the cartilage, there was a grey caseating tubercle the size of a pin's head. A similar tubercle was seen in the mucous membrane of the pharynx near the right cornu of the hyoid bone, and one in the mucous membrane in the angle of the thyroid below the glottis.

Submaxillary Glands.—In the right submaxillary region there was a group of seven lymphatic glands, the largest a little over 1 cm. in diameter ; three of these were closely beset with minute yellowish white softened foci ; the other four were normal.

On the left side there was a group of six glands, four of which contained scattered caseous foci.

Cervical Glands.—With the exception of one small gland in the right posterior triangle, all the lymphatic glands in the neck from the base of the skull to the root of the neck were enlarged and caseous ; on account of this enlargement and caseation numbers of small glands had become visible which under normal conditions are imperceptible. On the right side there was a continuous chain of glands extending from the angle and ramus of the jaw to the clavicle ; this chain was fully exposed on cutting through and reflecting the sterno-mastoid muscle ; it contained in all eight glands ranging in size from a large pea to a walnut. At the upper end, where the largest glands occurred, two of the glands were in the same horizontal plane, one at the angle of the jaw, the other between the latter and the submaxillary salivary gland ; the others were arranged parallel and external to the internal jugular vein. Externally these glands were yellowish white ; on section they were completely destroyed by caseation and showed a greyish white irregularly softened pulpy mass.

At the lower end of the chain behind the clavicle there were three small glands which contained caseous foci.

On the left side, extending from the angle of the jaw downwards for two inches along the jugular vein, there was a chain of glands composed at the upper end of two large glands which had fused together, forming a mass an inch and a quarter long and half an inch in diameter, and at the lower end of a group of three or four small glands ; all the glands were caseous throughout, except one small one, which was beset with more or less discrete foci.

Anterior and internal to the great vessels there was a number of small caseous glands, situated chiefly about the left lobe of the thyroid.

At the posterior border of the left sternomastoid, close to the mastoid process, there was a small gland which contained numerous foci.

Behind the clavicle on this side there was a series of four glands, ranging in size from a small pea to a kidney bean ; one was caseous throughout ; the others were beset with caseous foci.

Pharyngeal Glands.—On the right side, posterior to the pharynx, there was a mass of caseous and softened glands, two inches in length ; these were closely matted together and to the surrounding structures by new formed connective tissue ; one of the glands was in close relation to the tonsil.

Between this mass and the cervical chain there were several very small caseous glands.

On the left side, in a corresponding position, and extending down to about the level of the thyroid, there was a group of six softened caseous glands ranging in size from a quarter to three-quarters of an inch in diameter ; the capsules of these glands were thickened and fibroid, and had fused together.

One pre-laryngeal and three pre-tracheal glands, about the size of kidney beans or less, showed caseous foci.

In the substance of the right submaxillary salivary gland, beneath the capsule, there was a congested caseous tubercle 1·5 mm. in diameter.

The right half of the thyroid gland contained from twelve to fifteen yellowish nodules, ranging from 1 to 4 mm. in diameter ; these were grouped chiefly at the upper end, and on section were caseous and beginning to soften ; they each had a narrow translucent periphery.

In the right half of the hyo-glossus muscle and in the belly of the left digastric there was a caseous nodule, the size of a No. 1 shot.

Abdomen :

The peritoneal cavity contained a small amount of clear serous fluid.

The great omentum was studded with numbers of firm nodules ranging in size from 1·5 to 3 mm. in diameter ; the nodules were opaque and white in the centre, translucent at the periphery ; near the spleen the nodules were more closely aggregated and in some instances had fused together. In addition to the above, growing apparently from fine lymphatic vessels, there were very numerous pearly miliary tubercles.

Similar nodules and tubercles were seen in the lesser omentum.

In the mesocolon there were sparsely scattered nodules similar to those in the omentum, but not exceeding 2 mm. in diameter.

The parietal peritoneum, especially in the flanks and on the anterior wall, was profusely covered with transparent points just visible to the naked eye ; in the neighbourhood of the spleen there were also numerous caseating nodules, resembling those in the omentum.

On the serous surface of the cardiac end of the stomach there were about half a dozen loosely pedunculated caseous nodules, the size of a shot, and some flattened irregular deposits of pale tuberculous tissue. Passing between the diaphragm and the stomach at this end there was a flat band of tough fibrous tissue, three-quarters of an inch broad, in which were seen a few yellow foci.

Spleen.—The spleen was greatly enlarged, measuring 3¾ in. by 1¾ in. by ¾ in. ; on the surface there were a few flattened nodules about 1·5 cm. in diameter, with opaque whitish centres and translucent margins.

The substance contained four large nodules, varying from 1 to 2 cm. in greatest diameter, and a considerable number of smaller ones from 2 to 5 mm. in diameter ; the large nodules all formed marked projections on the surface, where they had contracted firm adhesions to the surrounding structures ; on the convex surface one nodule was intimately adherent to the parietal peritoneum, and a second one to the peritoneum covering the left kidney ; on the concave surface near the anterior margin there was an oval nodule 2 by 1 by 1.5 cm. ; this projected 1 cm. above the surface, and was adherent to the omentum.

Many of the smaller nodules also formed slight eminences, those on the convex surface being connected to the parietal peritoneum by slender strands of connective tissue. On section all the nodules were caseous, and showed varying degrees of softening.

Liver.—The margin of the left lobe of the liver was fixed to the diaphragm by recent, and to the stomach by older adhesions ; the right lobe was adherent by tough bands of fibrous tissue to the dorsal half of the diaphragm ; the capsule of the liver was thickened at these points.

Evenly distributed throughout the substance there were numbers of whitish spherical tubercles, about the size of mustard seeds ; in addition there were several larger caseating nodules, the largest 3 mm. in diameter, some of which formed flattened projections on the surface.

Portal Glands.—Normal.

Kidneys.—In the cortex of the left near the surface there were about a dozen minute translucent tubercles, slightly opaque in the centre.

The right contained three similar tubercles.

Suprarenal Bodies.—Normal.

Stomach.—Mucous membrane normal.

Large Intestine, Small Intestine.—Normal throughout.

Gastric Glands, Mesenteric Glands, Colic Glands.—Normal.

Numerous small glands around the pancreas were also normal.

One cœliac gland, 1 cm. in diameter, was caseous throughout, and irregularly softened.

Along the splenic vessels and in the hilum of the spleen there were six to eight small glands, all of which showed scattered caseous foci in their cortices.

Thorax :

The pericardial sac contained a small amount of clear serous fluid.

Heart Muscle.—Normal.

Lungs.—Were pinkish in colour and only slightly pigmented.

The right lower lobe was with difficulty removed on account of firm fibrous adhesions to the dorsal wall of the thorax.

The left lung was free from adhesions; it contained about three dozen firm nodules evenly distributed, ranging in size from 1 up to 5 mm. in diameter; the nodules were caseous in the centre, and had dark grey translucent margins.

In the lower lobe near the root there was a large patch of consolidation, and in the upper lobes several smaller ones; these patches were fleshy, dark red in colour, and sank in water.

In the right upper lobe there was a group of small caseating tubercles the size of pins' heads, surrounded by congested lung tissue; in addition there were three or four larger nodules.

The right middle lobe was adherent by slender connective tissue bands to the lower lobe, and was partly consolidated; this lobe contained numerous nodules, but more abundant in the consolidated than in the crepitant portions. Section through the solid patch showed numerous yellow points, as well as nodules; there was an increase in the interstitial connective tissue, and the bronchi exuded yellow, purulent material.

An accessory right middle lobe contained a large firm caseous nodule, over 1 cm. in diameter, and about half a dozen tubercles, each the size of a shot.

The right lower lobe contained two to three dozen caseous nodules from 1·5 up to 4 mm. in diameter.

Thoracic Glands.—The bronchial glands were darkly pigmented; those on the left side, four in number, contained minute scattered greyish white points; on the right side there were two slightly enlarged and œdematous glands, one above and one below the bronchus; the former gland was normal; the latter closely beset with caseous foci.

Behind the manubrium sterni there were two glands which showed very early foci.

Diaphragm.—On the peritoneal surface there were numerous flattened caseating nodules, ranging in size from 2 to 5 mm. in diameter; they occurred chiefly on the left side, where they were closely aggregated, and along the line of union of tendon and muscle.

On the pleural surface there was a moderate number of similar nodules.

On both surfaces there were also numerous miliary tubercles.

The skin of the groin at the site of inoculation of tuberculin showed a dry, reddish-brown adherent slough; the subcutaneous tissues beneath were congested and œdematous.

Brain and Meninges, Iliac Glands, Inguinal Glands, Axillary Glands, Uterus, Fallopian Tubes.—Normal.

Microscopical Examination.

Smears from :—

Cœliac Gland.—Two long tubercle bacilli.

Submaxillary Gland.—One tubercle bacillus.

Cervical Gland.—A few tubercle bacilli.

Thyroid Nodule.—One tubercle bacillus.

Spleen.—Six tubercle bacilli.

Laryngeal Tubercle.—Two tubercle bacilli.

ANIMALS INOCULATED.

Rabbits.

A rabbit inoculated intraperitoneally with an emulsion from a cervical gland died of general tuberculosis in 88 days. Another rabbit inoculated intravenously with the same emulsion died a few minutes after inoculation.

Guinea-Pigs.

Guinea-pig 970 was inoculated intraperitoneally, the rest subcutaneously.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
966	220	Peritoneal Fluid	Died 106 days	General Tuberculosis.
967	220	E. of Spleen	Died 37 days	General Tuberculosis.
968	260	E. of Mesenteric Gland	Killed 75 days	Healthy.
969	200	E. of Cervical Glands	Died 37 days	General Tuberculosis.
970	160		Died 5 days	Acute Infection.

BABOON 4. (Young.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—9·25 c.c.

Number of tubercle bacilli—5,000,000.

Killed—February 26th, 1904.

Duration of Experiment—35 days.

Clinical History.

The baboon became ill two or three weeks after the experiment began, and was killed in a dying condition on February 26th, 1904.

Temperature.

The temperature during the first three weeks varied for the most part between 39 and 40° C.; it then began gradually to fall, and on February 22nd and 25th fell as low as 35·5° C.; on February 26th (the day of death) the temperature was too low to be registered on a clinical thermometer.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

In the subcutaneous tissues on the left side of the thorax, lying over the seventh costal cartilage, there was a thin-walled yellow nodule, the size of a pea, full of thick viscid yellow pus.

At the seat of inoculation of tuberculin on the left side of the abdomen, there was slight thickening and reddening of the subcutaneous tissues.

Tongue, Tonsils, Pharynx.—Normal.

Pharyngeal, Submaxillary, and Parotid Lymphatic Glands.—Normal.

Cervical Glands.—Normal.

Abdomen :

Omentum.—Was devoid of fat, but was free from tubercle.

The lymphatic glands in the omentum, along the great curvature of the stomach, were normal in size and appearance.

Stomach.—Normal.

Small Intestine.—About a foot above the ileo-cæcal valve there was beneath the mucous membrane a yellow softened nodule, the size of a pin's-head; the small intestines were elsewhere normal.

Large Intestine.—A few inches above the anus there was a submucous nodule, the size of a large pea; this was filled with soft yellow pus. No intetinal parasites were found.

Mesenteric Glands.—Not enlarged or obviously tuberculous.

The glands around the lower end of the ileum and along the whole length of the large gut were perfectly normal to the naked eye.

Liver.—Was pale and soft, and showed on the surface a number of minute greyish white specks of a doubtful nature.

Portal Gland.—Near the portal fissure there was an enlarged gland 1·5 cm. in diameter, and 2 cm. long; on section this was found to be uniformly softened and to contain thick viscid yellow pus.

Spleen.—Showed on its convex surface a smooth fluctuant hemispherical projection, about 1·5 cm. in diameter; the surface of the projection was mottled, purple and yellow. When cut into it was seen to be a thin-walled cyst containing watery, slightly blood-stained fluid and yellow shreddy material. The yellow shreds adhered to the internal wall of the cyst, on which were also seen some recent blood clots. The spleen was elsewhere normal.

In the hilum of the spleen, near the tail of the pancreas, there was a spherical yellow softened nodule, the size of a large pea.

Kidneys.—The right kidney showed in the cortex on the surface a grey translucent focus, the size of a mustard seed.

A similar but smaller point was seen on the surface of the left kidney.

Suprarenal Bodies.—Normal.

Lumbar Glands.—The right lumbar gland, as compared with the left, was enlarged, and contained a pin-head sized yellow focus.

Thorax :

On removing the sternum, the right lung was seen to be firmly adherent over the greater part of the chest wall, and to the central part of the diaphragm.

Between the lower ribs, the base of the lung, and the outer part of the diaphragm, there was a space which was filled with clear serous fluid.

The pericardial sac contained a small quantity of fluid; the apical portion of the sac was considerably widened as a result of adhesions (to the lung) which had drawn the pericardium upwards and to the right; there were no adhesions between the heart and pericardium; the heart muscle and valves were normal.

In front of the trachea, above the base of the heart, there was a mass (glandular ?) the size of a walnut, which on section showed a thickened capsule and yellow softened contents.

Above this there was a small nodule (? glandular) in front of the trachea, and three similar in size rather more to the right; these were about 1 cm. in diameter, and resembled on section the larger gland.

Lungs.—On attempting to remove the right lung, it was found impossible to do so without leaving considerable portions of lung tissue adhering to the chest wall and diaphragm.

The tissue of the right lung was collapsed and airless and of a dark red colour. In the depth, extending from the root outwards, there was felt a hard nodular mass, the size of a Tangerine; this when cut into was seen to be made up of a group of yellow nodules, about 1 cm. in diameter, surrounded by dense bands of connective tissue. All the nodules were more or less softened.

Three or four yellow nodules, the size of small peas, occurred separated from the main mass in the collapsed lung tissue.

The right bronchus was filled with soft pus similar to that contained in a nodule; the pus projected into and partly filled the trachea at the level of the bifurcation; a small mass of this material had been detached, and was found halfway up the trachea. The left bronchus was unobstructed.

The left lung was free from adhesions, and was crepitant throughout. The upper lobe contained two nodules, one a large yellow one, 5 mm. in diameter, the other the size of a mustard seed, with translucent margins and a whitish centre. In the lower lobe there were four nodules, one 3 mm. in diameter, similar to the first one described, the others resembling the latter.

Bronchial Glands.—The left bronchial gland contained two or three yellow softened nodules. A gland on the side of the trachea above this was normal.

Firm yellow nodules were found along the whole length of the posterior mediastinum.

Diaphragm.—The tendon on the left side showed spherical pea-sized yellow nodules.

On the right side there was a series of seven or eight nodules which had become united together at their points of contact; they were situated wholly in the tendinous portion, and formed an almost complete ring just inside the margin of the muscle ; the nodules were firm, yellow, and measured 1·5 cm. in diameter. On section they were softened, but only in their centres, the marginal parts remaining firm and dense.

The nodules projected about equally on each side of the diaphragm, and adhered to the capsule of the liver on the one hand and the lung on the other.

In the centre of the ring there was an isolated nodule similar to that on the left side.

The surface of the right costal pleura showed a number of yellow elevations ; these were evidently nodules which had formed beneath the pleura. On the shafts of some of the upper ribs, and on several of the lower, the nodules were isolated, but on the middle ribs (fourth to eighth) and along the vertebral column the nodules had run together to form a continuous raised bossy area about 5 cm. thick.

When cut into, all the nodules were found to contain thick yellow pus ; the pleura over them was greatly thickened.

Inguinal Lymphatic Glands, Axillary Lymphatic Glands, Iliac Lymphatic Glands, Brain, Meninges.—Normal.

Microscopical Examination.

Smears from :

Intestinal Nodule (*a*), *Intestinal Nodule* (*b*).—Numerous tubercle bacilli.

Subcutaneous Nodule.—No tubercle bacilli.

Diaphragmatic Nodule.—Two tubercle bacilli.

Emulsion of Mesenteric Glands.—No tubercle bacilli.

Liver.—No acid-fast organisms. A few bacilli stained blue.

Spleen.—No tubercle bacilli. A few slender organisms stained blue.

Kidney.—One or two thick bacilli, and a few slender ones stained blue ; no tubercle bacilli.

Hepatic Gland.—Five tubercle bacilli seen.

Animals Inoculated.

Two guinea-pigs inoculated with an emulsion of a diaphragmatic nodule died of tuberculosis.

A guinea-pig inoculated with an emulsion made from the hepatic gland died of general tuberculosis.

A guinea-pig inoculated with an emulsion made from a mesenteric gland was killed after a period of 137 days and found healthy.

BABOON 10. (Adult.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—9·25 c.c.

Number of tubercle bacilli—5,000,000.

Killed—February 27th, 1904.

Duration of Experiment—36 days.

Clinical History.

The animal remained in good health during the experiment, and the temperature was normal throughout.

POST-MORTEM EXAMINATION.

Body.—Moderately fat ; muscles firm and well developed.

In the lymphoid tissue at the base of the tongue, on the left side, two small crypts were seen, filled with yellowish secretion (a little of the secretion from one of the crypts was squeezed out, stained and examined, but no tubercle bacilli were found).

Tonsils, Pharynx, Retropharyngeal Glands (close to the tonsils).—Normal.

On the left side, a little below and external to the left retropharyngeal gland, there was a gland the size of a small olive, which on section showed in the medulla an irregular cavity filled with soft whitish pus, and in the cortex a few whitish foci.

The corresponding gland on the opposite side was normal.

Submaxillary, Buccal, and Parotid Glands.—Normal.

Cervical Glands.—Normal.

Abdomen :

There was a fair amount of fat in the abdominal cavity.

Peritoneum.—Normal.

Omentum.—Was free from visible tubercles ; it contained near the stomach a small worm (about 1 in. long) coiled on itself, but not encysted ; this worm was segmented, and resembled a caterpillar.

Stomach.—Normal.

Intestines.—Three inches from the pylorus, beneath the mucous membrane, there was a nodule, yellow in the centre, the size of a No. 4 shot ; close to this there was a minute yellow point.

An inch or two lower down the mucous membrane showed a small erosion ; the edges of this were slightly raised, but there was no thickening of the base or sign of caseation. The rest of the small intestine showed nothing abnormal.

Large intestine normal throughout.

Gastric Glands.—Normal.

Mesenteric Glands.—About 4 in. from the pylorus, closely applied to the wall of the duodenum, there was an enlarged, tense gland, the size of a small filbert, which on section showed a number of softened patches, filled with pale whitish, somewhat viscid pus ; almost the whole of the gland tissue was destroyed.

About the middle portion of the mesentery there were four enlarged tense glands (the largest the size of the one just described), which showed on the surface, through the capsule, numerous yellow foci. When cut into all the glands were seen to be closely beset, particularly in the cortical portions, with softened areas from 2 mm. in diameter downwards, which, unlike those in the duodenal gland, had for the most part remained discrete.

There was no appreciable thickening of the capsule in any of the affected glands.

All other mesenteric glands were normal in size and appearance.

The glands around the lower end of the ileum and along the whole length of the large intestine appeared to be perfectly normal.

Liver, Hepatic Lymphatic Glands, Spleen, Kidneys, Suprarenal Bodies, Cœliac Lymphatic Glands, Lumbar Lymphatic Glands, Sacro-Iliac Lymphatic Glands.—Normal.

Thorax :

There were some old fibrous adhesions between the heart and pericardium particularly on the right side.

Pleura.—Normal. No adhesions.

Lungs.—Darkly pigmented. On the surface of the right upper lobe there was a light yellow spherical tubercle, the size of a No. 4 shot; this when cut into was found to be entirely softened. With this exception the lungs were normal.

Bronchial Glands, Mediastinal Glands, Brain, Meninges, Testicles, Inguinal Lymphatic Glands, Axillary Lymphatic Glands.—Normal.

Microscopical Examination.

Smears :

Ileo-colic Gland.—No tubercle bacilli.

Mesenteric Gland.—A few tubercle bacilli.

Duodenal Gland.—Numerous tubercle bacilli.

Secretion from Crypt at Base of Tongue.—No tubercle bacilli.

Post-Pharyngeal Gland.—Numerous tubercle bacilli.

Intestine }
Lung } No tubercle bacilli.

Animals Inoculated.

Two guinea-pigs inoculated, one subcutaneously, the other intraperitoneally, with an emulsion made from a mesenteric gland. died of tuberculosis in 22 and 14 days respectively.

Two other guinea-pigs inoculated subcutaneously, one with an emulsion made from the spleen, and one with an emulsion made from the lung tubercle, died of general tuberculosis in 90 and 104 days.

BABOON 6. (Young.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—18·5 c.c.

Number of tubercle bacilli—10,000,000.

Killed—March 29th, 1904.

Duration of Experiment—67 days.

Clinical History.

The animal remained in good health during the experiment, and the temperature was practically normal throughout.

Tuberculin Test.

February 25th, 1904, 34 days after the experiment began. Negative.

POST-MORTEM EXAMINATION.

General Condition.—Good. The milk teeth had not been shed.

Tongue, Pharynx, Palate, Tonsils, Larynx, Pharyngeal Lymphatic Glands, Parotideal Lymphatic and Salivary Glands, Submaxillary Lymphatic and Salivary Glands.—Normal.

Mucous Lining of Stomach.—Normal.

Thymus.—Appeared large, and was perfectly normal.

Intestines.—Four feet from the pylorus a little red spot could be seen in a Peyer's patch. When examined under water this could be seen to be a minute ulcer with a yellow centre. It could be felt as a thickening of the gut when the latter was passed between finger and thumb. Nothing abnormal was visible from the peritoneal surface.

The rest of the small intestine, as well as the large intestine, was normal.

The *Mesenteric Glands* were considerably enlarged. There were seven or eight glands, varying in size from a pea to a large bean, the largest being about three-quarters of a inch in length. They were soft, and large yellow patches could be seen through their surfaces. On section they were filled with caseo-purulent contents, and when this was washed away little remained besides a multilocular cyst wall.

The largest glands were those opposite the upper part of the small intestine.

Besides these, there was a large number of smaller glands, situated nearer the margin of the mesentery. The majority of these appeared normal, while others showed yellow patches or a single small focus.

A gland near the ileo-cæcal valve, about the size of a small pea, was normal.

A large number of small glands, lying along the ascending and transverse colon, each corresponding to one of the larger branches of the mesenteric vessels, appeared to be normal.

Omentum, Peritoneum.—Normal

In the greater omentum, on the convex border of the stomach, was a gland the size of a small pea. On section it was found to be softened, and to contain caseo-purulent contents.

Spleen.—Was not enlarged, but close to the hilum was a small thin-walled abscess containing a thin brownish pus without caseous débris. The walls also showed no sign of caseation. The pus, however, contained tubercle bacilli.

Kidneys, Suprarenals.—Normal.

Liver.—Appeared normal on the surface. Section revealed a single shot-sized nodule, fairly firm, but showing signs of softening in the centre.

Cœliac Lymphatic Glands, Renal Lymphatic Glands, Iliac Lymphatic Glands.—Normal.

Pleura, Heart.—Normal.

Lungs.—In the sternal portion of the left upper lobe was a small yellowish spot, which on section was found to be filled with purulent contents contained in a thin-walled abscess.

The rest of the lungs were somewhat emphysematous at their margins, but otherwise normal.

Bronchial Glands.—One contained a small thin walled cyst (? tuberculous). The others were normal.

Uterus, Ovaries.—Normal.

Microscopical Examination.

Omental Gland.—No tubercle bacilli seen.

Mesenteric Gland (caseous matter from.)—Two tubercle bacilli seen.

Mesenteric Gland (caseous matter from.)—One tubercle bacillus seen.

Muco-Pus from Mesenteric Gland.—No tubercle bacilli seen.

Nodule from Liver.—One tubercle bacillus seen.

Nodule from Lung.—No tubercle bacilli seen.

Pus from Abscess in Spleen.—Five tubercle bacilli seen.

Ulcer from Intestine.—No tubercle bacilli seen.

Guinea-pigs Inoculated.

Two guinea-pigs were inoculated with an emulsion made from the mesenteric glands; one died of general tuberculosis in 53 days, the other in 12 days of a subacute infection and slight tuberculosis.

A guinea-pig inoculated intraperitoneally with an emulsion made from the spleen died of general tuberculosis in 49 days.

BABOON 12. (Adult.)

Fed—Once with tuberculous milk of Cow 64.

Date—January 22nd, 1904.

Amount of Milk—18·5 c.c.

Number of tubercle bacilli—10,000,000.

Accidentally killed—March 26th, 1904.

Duration of Experiment—65 days.

Clinical History.

No signs of illness were noticed during the experiment.

Temperature.

The temperature rose on the 62nd day to 39·4°C.; otherwise it was normal throughout.

POST-MORTEM EXAMINATIONS.

General Condition.—Good.

Tongue, Pharynx, Larynx, Tonsils, Post-Pharyngeal Lymphatic Glands, Submaxillary Lymphatic Glands, Submaxillary Salivary Glands, Sublingual Salivary Glands, Parotid Salivary Glands.—Normal.

Omentum, Peritoneum.—Normal, except for adhesions mentioned below.

Stomach.—Normal (showed numerous little follicles).

The Duodenum showed uniformly scattered little whitish rounded grains (Brunner's glands).

Ileum.—The lower 12 in. or so was congested. About 10 in. from the ileo-cæcal valve was a minute ulcer with raised edges, and close by was probably another, but the cut made by opening the gut passed through it, rendering examination unsatisfactory.

Cæcum.—The cæcum and the first 12 in. of large intestine were thickly studded with little slightly elevated whitish spots, the largest being from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. in diameter. Some of them showed a little dark point in the centre. They were most conspicuous at the commencement of the colon, and gradually became less so and more translucent, the transition occupying the middle of the colon (18. in. from the cæcal valve). These latter were evidently normal solitary follicles. It seemed to me doubtful whether the former were normal or no.

There were in addition three pea-sized dark coloured prominences of the mucous membrane, close to the ileo-cæcal valve, one being in the cæcum, full of soft dark green pultaceous matter.

Abdominal Lymphatic Glands.—Along the lesser curvature of the stomach in the small omentum was a series of glands (three in number), varying in size from a pea to a sparrow's egg, full of softened and caseous contents. Almost continuous with these there was a large mass of glands lying close to the spinal column, around the cœliac axis and in the root of the mesentery, to which a part of the duodenum was so closely adherent as to be separable with difficulty; the mass was closely incorporated with the pancreas, which, however, appeared to be normal. It measured $1\frac{3}{4}$ in. by $1\frac{1}{4}$ in. by $\frac{3}{4}$ in., and was very irregular in shape. On section it appeared to be composed of a mass of glands, caseous and softened, and united by dense pearly white fibrous tissue. This mass doubtless contained the cœliac and mesenteric glands. More posteriorly, and lying closer to the spinal column, was a group of renal glands on the right side as large as a walnut, and one on the left side entirely caseous and softened.

*Spleen.—Much enlarged, measured $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by 1 in. It was rendered nodular all over by pea-sized nodules, some of which just projected above the surface, while others appeared as cream-white hemispherical projections. The latter were extensively adherent to the diaphragm and to the omentum. When the latter was torn away a lenticular portion of each nodule remained adherent to it. On section pea-sized nodules up to $\frac{1}{3}$ in. in diameter were thickly crowded throughout the spleen, leaving but little functional tissue between. The nodules were rounded and composed of cream-coloured caseating tissue surrounded by firm translucent pinkish grey tissue with a cauliflower margin.

Kidneys.—Congested. The left showed no sign of tubercle.

The right kidney showed two small tubercles under the capsule.

Suprarenals.—The right was normal; the left was not found.

The Liver showed about thirty tubercles on its surfaces, the largest scarcely $\frac{1}{8}$ in. in dimeter. They were yellowish white and opaque, with a grey translucent margin. Attached to some was a little translucent film, scarcely visible, which overlay the surface of the liver, forming a narrow halo around the margin of the largest tubercles. Section showed some similar tubercles in the substance of the organ.

The Lungs were congested in patches, almost black along the dorsal margin. On section they exuded frothy fluid which filled the bronchi.

Nineteen tubercles were counted in the lungs; these had whitish centres and dark grey translucent margins; they were variable in size; the largest was not more than $\frac{1}{8}$ in. in diameter.

Thoracic Glands.—These were enlarged. Two glands on the sternal side of the trachea were each about as big as a sparrow's egg. On section they had a thick white capsule, extensions from which divided the glands into several compartments, each filled with caseous and liquefying contents. Along the spinal column there were several enlarged glands just within the opening of the thorax on the right side. Another as large as the above a little further back, and a continuous chain of small glands on the left side 2 in. in length still more posteriorly were full of caseo-purulent contents.

Heart, Pericardium.—Normal.

There was an excess of fluid in the pericardial sac.

Pleura.—Normal.

Testes.—Normal.

Lumbar Glands.—Normal.

No iliac or sacral glands found.

Inguinal Glands, Popliteal Glands.—Normal.

Gluteal Glands.—Not found.

Microscopical Examination.

Colon. Whitish spot (normal follicle)
Duodenum (solitary follicle) No tubercle bacilli.

Right Kidney.—Tubercle bacilli.

Emulsion of Spleen.—One tubercle bacillus.

Emulsion of Thoracic Gland.—Tubercle bacilli.

Guinea-pigs Inoculated.

Two guinea-pigs were inoculated with an emulsion made from the spleen and two were inoculated with an emulsion made from a thoracic gland. All died of general tuberculosis.

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* *See* Plate 4.

PIG 18.

Age—10 weeks.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 16th, 1904.

Amount of Milk—5·58 c.c.

Number of tubercle bacilli—1,000,000.

Killed—February 24th, 1904.

Duration of Experiment—39 days.

Clinical History.

The animal remained in good health throughout the experiment.

Temperature.

Slight rise on the 18th day (to 40°C.), then practically normal.

Weights.

	qrs.	lbs.
January 19th, 1904 - - - - -	1	6
February 16th, 1904 - - - - -	1	11

Gain in Weight.—5 lbs.

Average weekly gain.—1·25 lbs.

Tuberculin Test.

February 19th, 1904, 34 days after the experiment began. Positive. Rise of temperature, 2·5°C.

POST-MORTEM EXAMINATION.

Body.—Well nourished.

Tongue, Tonsils, Pharynx.—Normal.

Submaxillary Glands, Subparotid Glands, Pharyngeal Glands.—Normal in size and appearance.

Superficial and deep cervical glands normal.

Abdomen :

Omentum, Parietal Peritoneum.—Normal.

Stomach.—On the anterior surface of the stomach there was a series of short loosely attached strands of connective tissue, in two of which small hard bodies could just be detected (no tubercle bacilli). Mucous membrane of stomach normal.

Small Intestine.—The long Peyer's patch showed, about six inches from the ileo-cæcal valve, a minute star-shaped ulcer; the lymphoid tissue beneath was not thickened, but showed two minute whitish specks. The small intestines were elsewhere normal.

Large Intestine.—Normal throughout.

Mesenteric Glands.—A gland about the middle of the mesentery contained an indurated nodule 1 cm. in diameter, which on section showed early foci of caseation.

A gland at the hinder end of the mesentery felt indurated, but showed no obvious foci of caseation.

All other mesenteric glands were normal.

Ileo-colic Glands.—At the junction of the ileum with the cæcum there were two enlarged glands, one the size of a chestnut, the other half that size ; these consisted of firm translucent tissue, in which were embedded opaque whitish (or yellowish white) irregular patches of necrosis.

Several glands near these were normal.

Colic Glands.—The chain of glands between the coils of the large intestine was normal.

Rectal Glands.—Normal.

Spleen.—On the surface there was a short fibrous process similar to those on the stomach, but no definite tubercles could be felt (no tubercle bacilli); except for this the spleen was perfectly normal throughout.

Liver.—On the surface there was a number of whitish tubercles (thirty counted) ranging in size from a mustard seed to a No. 4 shot. Similar tubercles were seen in the substance ; many of the larger tubercles were slightly opaque in the centre.

Portal Glands.—Two small glands in the lesser omentum showed a few minute whitish foci.

Kidneys.—The left showed a few pale streaks in the cortex ; otherwise normal.

The right was normal on the surface and on section.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura, Diaphragm.—Normal.

Lungs.—The caudal lobe of the left lung showed on the dorsal surface a greyish, opalescent tubercle 2·5 mm. in diameter.

The right cephalic lobe contained a similar tubercle

The right caudal lobe showed near the surface a pinhead-sized translucent tubercle.

Thoracic Glands.—The dorsal mediastinal and bronchial glands appeared normal to the naked eye.

Larynx, Trachea, Thymus, Testicles, etc.—Normal.

The following lymphatic glands showed no macroscopic evidence of tuberculosis :—

Right and Left Prescapular, Right and Left Prepectoral, Right and Left Precrural, Right and Left Superficial Inguinal, Right aad Left Iliac, Sacro-Iliac, Lumbar, Right and Left Popliteal, Ventral Mediastinal.

There was slight œdematous swelling of the subcutaneous tissues at the seat of inoculation of tuberculin in the right thigh ; the skin over the thickening was desquamating.

The popliteal and superficial glands on the right side were twice the normal in size.

Microscopical Examination.

Smears from :

Mid Mesenteric Gland.—Tubercle bacilli, not numerous.

Ileo-Cæcal Gland.—Tubercle bacilli fairly numerous.

Spleen.—No tubercle bacilli.

Liver.—One tubercle bacillus.

Stomach (*surface tubercle*).—No tubercle bacilli.

Glands in Lesser Omentum.—Numerous tubercle bacilli.

Terminal Mesenteric Gland - } No tubercle bacilli.
Lung - - - - - }

Guinea-Pigs Inoculated.

A guinea-pig inoculated subcutaneously with an emulsion made from the terminal mesenteric gland died in 45 days of general tuberculosis.

Two guinea-pigs inoculated with an emulsion made from an ileo-cæcal gland died of an acute infection, too early for tuberculosis to manifest itself. Another guinea-pig inoculated with an emulsion made from spleen remained healthy.

PIG 44.

Age—9 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 19th, 1904.

Amount of Milk—1·41 c.c.

Number of tubercle bacilli—1,000,000.

Killed—March 5th, 1904.

Duration of Experiment—46 days.

Clinical History.

There were no signs of ill health during the experiment.

Temperature.

There was a slight rise to 39·5°C. on 21st day, otherwise normal throughout.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	1	14
March 1st, 1904 - - -	1	2	21

Gain in weight.—1 qr. 7 lbs.

Rate of gain per week.—$5\frac{5}{6}$ lbs.

Tuberculin Test.

March 2nd. 43 days after the experiment began. Positive. Rise of temperature 2·0°C.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue, Pharynx, Surface of Palate.—Normal.

Submaxillary Lymphatic Glands.—The left, the size of a small walnut, contained scattered caseous deposits.
The right, the size of a small bean, was normal.

Right Submaxillary Salivary Gland, Left Submaxillary Salivary Gland.—Normal.

Parotid Lymphatic Glands.—On the left side two were normal. No glands were found on the right side.

Small Intestine.—A Peyer's patch showed some granules (normal ?) a little larger and whiter than the rest, similar to those described in Pig 40. The rest of the small intestine was normal.

Large Intestine, Mesenteric Glands, Glands at Ileo-caecal Valve.—Normal.

Colic Glands.—Normal, with one exception, which contained a minute caseous mass which easily shelled out.

Lungs, Right and Left Bronchial Lymphatic Glands.—Normal.

Heart, Pericardium, Pleura.—Normal.

Diaphragm, Omentum, Peritoneum.—Normal.

Spleen.—One fibroid patch was seen on the surface, the size of a pin's head. Substance normal on section.

Liver, Hepatic Lymphatic Glands.—Normal.

Kidneys.—The right showed one pin-head opaque point; otherwise normal. The left was normal.

Suprarenals.—Normal.

Various Lymphatic Glands :

Right Prescapular, Left Prescapular.—Normal.

Right Popliteal, Right Iliac, Left Iliac, and *Precrural Glands.*—Normal.

Guinea-pigs Inoculated.

A guinea-pig inoculated with an emulsion made from the spleen was killed in 86 days; the post-mortem examination showed pseudo-tuberculous lesions. One guinea-pig inoculated with emulsion made from the kidney and two guinea-pigs inoculated with an emulsion made from a mesenteric gland remained healthy after 86 days.

PIG 24.

Age—10 weeks.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 16th, 1904.

Amount of Milk—27·94 c.c.

Number of tubercle bacilli—5,000,000.

Killed—February 22nd, 1904.

Duration of Experiment—38 days.

Clinical History.

The animal showed no signs of illness during the experiment.

Temperature.

Slightly raised between the 18th and 22nd days (highest 40·2°C.); then never exceeding 39·3°C.

Weights.

	qr.	lbs.
January 19th, 1904 - - - -	1	9
February 16th, 1904 - - - -	1	14

Gain in weight.—5 lbs.

Average weekly increase.—1·25 lbs.

Tuberculin Test.

February 19th, 1904. 34 days after the experiment began. Positive. Rise of temperature 1·3°C.

POST-MORTEM EXAMINATION.

Body.—Well nourished.

Tongue, Tonsils, Pharynx.—Normal.

Pharyngeal Glands.—The right retro-pharyngeal gland was enlarged to the size of a walnut and indurated. On section it showed an irregular network of opaque whitish, or yellowish white, necrotic tissue, embedded in a grey translucent matrix.
The left pharyngeal gland was normal.

Submaxmillary Glands.—One right submaxillary gland resembled in every respect the right pharyngeal gland.

Two other submaxillary glands on the right side were slightly enlarged and showed a few early foci of caseation.

The glands in the left submaxillary region were normal.

Subparotid Lymphatic Glands.—The right and left subparotid glands normal.

Cervical Glands (superficial and deep).—Normal.

Oesophagus.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach.—Normal.

Intestines (large and small).—Normal throughout. No sign of ulceration anywhere.

Mesenteric Glands.—A gland about the middle of the mesentery contained a firm nodule 5 mm. in diameter, in which were some early foci of caseation. The last of the series of mesenteric glands felt indurated, but was not obviously enlarged ; no opaque points were seen on section. (Tubercle bacilli were found in a smear made from this gland.)

The rest of the mesenteric glands appeared quite normal.

Ileo-Caecal Glands.—One ileo-caecal gland, the size of a Brazil nut, was beset with opaque whitish foci of caseation.

Several glands in the neighbourhood of this were unaffected.

The glands in the midst of the coils of the large intestine were normal in size and appearance.

Rectal Glands.—Normal.

The Spleen contained eight tubercles, ranging in size from a pin's-head to a small shot ; all were beginning to caseate ; three formed rounded congested elevations on the surface.

The Liver showed on the surface and in the parenchyma a moderate number of pearly white tubercles the size of pinheads ; at the margin of one of the right lobes there was a little group of these tubercles which had coalesced. The liver substance also contained innumerable whitish foci, just visible to the naked eye.

Portal Glands.—One of the glands in the small omentum felt indurated and showed on section three or four minute whitish foci (tubercle bacilli found). A gland near the portal fissure was similarly affected.

Kidneys.—The right kidney, on radial section, showed in the cortex a few pale streaks, which were seen on the surface as whitish points.

The left kidney was normal.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura, Diaphragm.—Normal.

Lungs.—Evenly distributed throughout both lungs there was a considerable number (some hundreds) of grey translucent tubercles ; most of the tubercles were about the size of pin-heads, but there were many that were much smaller ; the majority showed a minute central opacity.

Mediastinal Glands.—The dorsal mediastinal glands appeared normal.

The Bronchial Glands were not obviously enlarged, but felt slightly hardened. On section the right bronchial showed one or two whitish points. (No tubercle bacilli were found in a smear.)

Larynx, Trachea, Testicles, Epididymis, Brain, Meninges, Thymus.—Normal.

The following lymphatic glands showed no sign of tuberculosis :—

Right and Left Prescapular, Right and Left Prepectoral, Right and Left Precrural, Right and Left Superficial Inguinal, Right and Left Iliac, Sacro-Iliac, Lumbar, Right Popliteal.

At the seat of inoculation of tuberculin in the right thigh the subcutaneous tissues were slightly thickened and œdematous.

The superficial inguinal and popliteal glands on the right side were twice the normal in size, and were slightly œdematous.

Microscopical Examination.

Smears from :

Retro-Pharnygeal Gland.—Numerous tubercle bacilli

Middle Mesenteric Gland.—Fairly numerous tubercle bacilli.

Ileo-Caecal Gland.—A few tubercle bacilli.

Gland in Small Omentum.—Numerous tubercle bacilli.

Lung Nodule.—Three tubercle bacilli seen.

Gland near Portal Fissure.—Two tubercle bacilli seen.

Spleen.—Four tubercle bacilli.

Terminal Mesenteric Gland.—A few tubercle bacilli.

Right Bronchial Gland.—No tubercle bacilli.

Guinea-pigs Inoculated.

One guinea-pig inoculated with an emulsion made from a mesenteric gland (not obviously tuberculous) and one with an emulsion from the spleen remained healthy after 78 days.

Guinea-pigs inoculated with emulsions made from an ileo-cæcal gland and the kidney died of an acute infection.

PIG 34.

Age—7 to 8 months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 19th, 1904.

Amount of Milk—7·05 c.c.

Number of tubercle bacilli—5,000,000.

Killed—March 5th, 1904.

Duration of Experiment—46 days.

Clinical History.

The animal remained in good health during the experiment.

Temperature.

There was a slight rise on 28th and 29th to 40·3°C. and 40·2°C.; then practically normal.

Weight.

	cwt.	qr.	lbs.
January 19th, 1904 - - -	1	0	19
March 1st, 1904 - - -	1	1	4

Increase in weight.—13 lbs.

Average weekly increase.—$2\frac{1}{6}$ lbs

Tuberculin Test.

March 2nd. 43 days after the experiment began. Positive. Rise of temperature, 2·5°C.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue, Pharynx, Palate,—Normal.

Submaxillary Lymphatic Glands.—The right was very lobulated and irregular, and measured $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. On section it was seen to be really a group of three glands, all with caseous deposit, the middle larger one more so than the others.

The left was kidney-shaped, 2 in. by 1½ in. by 1 in. On section a large amount of caseous deposit was seen.

Submaxillary Salivary Glands.—Apparently normal.

Pharyngeal Lymphatic Glands.—Lying close to the hyoid bone, normal on both sides.

Deep Parotideal Lymphatic Glands.—On both sides normal.

Thymus.—Spotted with little irregular creamy white points, not seen either in Pig 46 or 44.

Stomach.—Normal.

Small Intestine.—In one Peyer's patch, about 8 ft. from the ileo-cæcal valve, was a depression corresponding to which, on the peritoneal surface, was a yellow spot. It was apparently a beginning ulcer. The rest of the small intestine was normal.

Large Intestine.—Normal.

There was one round worm in the small, and five in the large intestine.

Rectum.—On the under surface of the rectum, in the middle line, was a small yellowish projection, about the size of a very small pea, caseous on section.

Mesenteric Glands.—Very few were apparently normal, the rest were enlarged and caseous to a varying extent. Those in the anterior part of the mesentery were more affected than those in the lower. In none could any calcareous foci be found.

Ileo-colic Glands.—Were about twelve in number and varied in size from a walnut to a large pea. All but four showed on section caseous deposit, some more, some less; the largest ones, the size of a walnut, were caseous for at least three-quarters of their substance; none of them was gritty on section.

Colic Glands.—One of the colic glands, situated apparently about the middle of the colon, contained a nodule about the size of a pea, which on section was mottled with caseous material.

In the left inguinal region, in the subcutaneous tissue, were about a dozen little spherical bodies, the larger ones about the size of a large pea. On section they were found to be thin-walled, and to be filled with soft pultaceous matter.

Lying on one of the folds of the colon, and projecting from the surface, was a nodular hemispherical mass, the size of a large pea. When cut open, like the mass above described, it had a botryoidal pultaceous mass inside.

Omentum, Peritoneum.—Normal.

On the edge of the lesser omentum were two glands, each about an inch in long diameter, lobulated in external appearance. On section they were somewhat firm, and had a suspicious lobulated appearance, but were not definitely tuberculous.

Spleen.—Normal.

Liver.—On the surface of the lobe above the gall bladder was an opaque yellow body the size of a No. 1 shot, partly embedded, partly projecting (tubercle ?). Scattered over the surface of the organ was a number of grey specks (tuberculous ?).

A few minute specks of a similar nature were found in the substance on section.

Hepatic Lymphatic Glands.—Normal.

Kidneys.—Each kidney was mottled (peppered) on the surface with minute grey points. On section some of these points were seen to extend into the cortical substance, but the rest of the kidney appeared normal.

Suprarenals.—Normal.

Pleura, Diaphragm (on both sides), *Lungs, Right and Left Bronchial Glands, Heart, Pericardium.*—Normal.

Various Lymphatic Glands :

Left Prescapular.—Apparently normal, as was also a gland lying ventral, and cephalic to the above.

Right Prescapular.—Was also normal.

Popliteal, Precrural, Iliac, Pudic.—Normal.

Uterus.—Atrophied.

Ovaries.—Non-existent.

At the seat of inoculation of tuberculin (three days ago), on the inner side of thigh, the subcutaneous tissue was swollen and œdematous, forming an oval mass about 4 in. by 3 in. by 2 in.

Microscopical Examination.

Nodule from Inguinal Region.—Three tubercle bacilli seen.

Nodule from Peritoneal Surface of Colon.—No tubercle bacilli seen.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS (GUINEA-PIG 882 WAS INOCULATED SUBCUTANEOUSLY).

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
880	200	E. of Spleen	Died, 13 days	Slight Tuberculosis.
881	200	E. of Kidney.	Killed, 44 days	Healthy.
882	170	E. of Submaxillary Gland	Died, 42 days	General Tuberculosis.
883	170	E. of Submaxillary Gland	Died, 10 days	Slight Tuberculosis.

PIG 26.

Age—10 weeks.

Fed—Once with the tuberculous milk of Cow 64

Date—January 16th, 1904.

Amount of Milk—55·85 c.c.

Number of tubercle bacilli—10,000,000.

Killed—February 22nd, 1904.

Duration of Experiment—37 days.

Clinical History.

The animal showed no signs of illness during the experiment.

Temperature.

Slight rise on 20th day to 40·1°C.; then for about a week varying between 39·1° and 39·8°C. On 29th and 30th days temperature 40·3°C.; normal again on the 32nd and on subsequent days.

Weights.

	qr.	lbs.
January 19th, 1904 - - - - -	1	9
February 16th, 1904 - - -	1	14

Gain in weight.—5 lbs.

Average gain per week.—1·25 lbs.

Tuberculin Test.

February 19th, 1904, 34 days after the experiment began. Positive. Rise of temperature, 2·0° C.

POST-MORTEM EXAMINATION.

Body.—Well nourished.

Tongue, Pharynx, Oesophagus.—Normal.

Tonsils.—Normal in appearance.

Right Retro-Pharyngeal Gland.—Enlarged (1⅛ in. by 1 in. by ½ in.) and indurated, showed on section firm opaque whitish caseous patches, irregular in outline, embedded in a greyish translucent matrix.

Left Posterior Pharyngeal Gland.—Apparently normal.

Submaxillary Glands.—One right submaxillary gland was enlarged (size of a Brazilian nut) and hard, and showed numerous caseous foci; two small glands near this were normal.

In the left submaxillary region there was a firm mass, formed apparently by the fusion of two lymphatic glands, measuring 1⅔ in. by 1⅛ in. by ¾ in.; on section it closely resembled the pharyngeal gland.

Parotid Lymphatic Glands, Superficial and Deep Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach.—Normal.

Intestines.—In the last 5 feet of small intestine there were seen five minute superficial ulcers. All occurred in Peyer's patches, the long terminal gland containing four; the bases of the ulcers were not appreciably thickened, and there were no subperitoneal tubercles; the lymphoid tissue beneath one ulcer seemed a little opaque, and beneath another showed one or two minute whitish specks; the margins of three of the ulcers were hyperæmic. The rest of the small intestine was normal.

Large intestine normal throughout.

Gastric Glands.—The group of glands on the surface of the stomach and in the lesser omentum showed no naked eye evidence of tuberculosis.

Mesenteric Glands.—The first five mesenteric glands were normal; the sixth was slightly indurated, and showed a few suspicious whitish specks. (No tubercle bacilli found.)

Three glands about the middle, and two at the posterior end of the mesentery presented firm nodular enlargements, from 7 to 10 mm. in diameter, which on section showed small areas and foci of caseation. Two of the mesenteric glands felt indurated, but were not caseous.

Around the lower end of the ileum there were five enlarged uniformly indurated glands, varying in size from a kidney to a broad bean, which on section showed numerous small areas of caseation.

A colic gland, the size of a pea, 6 in. from the ileocæcal valve, was closely beset with caseous foci.

The lymphatic glands between the coils of the large intestine showed two pea-sized caseous nodules.

A small tuberculous gland was seen on the large intestine, about 2 ft. from the anus.

In none of the affected glands was there any sign of softening.

The Rectal Glands appeared slightly enlarged and were œdematous.

The Spleen showed on the surface two translucent tubercles, smaller than mustard seeds; the pulp contained one spherical tubercle, the size of a pin's head, with an opaque yellowish centre (tubercle bacilli found.)

The Liver showed on both surfaces a considerable number of greyish white translucent tubercles, from 0·5 to 1·5 mm. in diameter; the larger tubercles had opaque whitish centres; similar tubercles were seattered throughout the substance.

Hepatic Lymphatic Glands (two in number).—Showed a few suspicious whitish specks (no tubercle bacilli found).

Kidneys.—Both kidneys contained in the cortex innumerable pale whitish foci, which gave the surface a peculiar speckled or mottled appearance. The foci were not readily detected in the deeper parts of the kidney, but some of those on the surface could be seen to extend a variable distance into the cortex. (No tubercle bacilli found.)

Suprarenal Bodies.—Normal.

Thorax :

Lungs.—Evenly distributed throughout both lungs there were very numerous (some hundreds) translucent shotty tubercles; these were generally about the size of a pin's head, but there were numbers that were smaller; in most of the tubercles there was a minute central opacity.

Bronchial Glands.—The right and left bronchial glands appeared normal to the naked eye.

A peribronchial gland on the right side was indurated, and showed a few minute whitish foci. (Tubercle bacilli found.)

The glands in the dorsal mediastinum were normal.

Parietal and Diaphragmatic Pleura, Heart, Pericardium.—Normal.

Larynx, Trachea, Testicles, Brain and Meninges.—Normal.

The following lymphatic glands showed no signs of tuberculosis:

Right and Left Prescapular, Prepectoral, Precrural, Superficial Inguinal, Iliac, Sacro-Iliac, Lumbar.

A group of glands between the trachea and episternum was also normal.

At the seat of inoculation of tuberculin (three days previously) in the right thigh there were some thickening and œdematous infiltration of the subcutaneous tissues.

The right superficial inguinal glands were about twice the size of the left and were œdematous.

Microscopical Examination.

Smears from :

Mesenteric Gland.—Tubercle bacilli moderately numerous.

Spleen.—One tubercle bacillus seen.

Liver.—Three tubercle bacilli seen.

Right Peribronchial Gland.—Seven tubercle bacilli seen.

Lung.—One tubercle bacillus.

Retro-Pharyngeal Gland.—Tubercle bacilli numerous.

Sixth Mesenteric Gland *Gland near Portal Fissure* *Kidney* (two smears)	No tubercle bacilli.

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
856	290	E. of Spleen	Killed 56 days	General Tuberculosis.
857	170	E. of Mesenteric Gland	Died 17 days	Tuberculosis.
858	240	E. of Left Bronchial Gland	Died 48 days	General Tuberculosis.
859	250	E. of Left Kidney	Killed 56 days	Healthy.

PIG 40.

Age—Nine months.

Fed—Once with the tuberculous milk of Cow 64.

Date—January 19th, 1904.

Amount of Milk—14·1 c.c.

Number of tubercle bacilli—10,000,000.

Killed—March 4th, 1904.

Duration of Experiment—45 days.

Clinical History.

The animal remained in good health during the experiment and the temperature was normal throughout.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	2	21
March 1st, 1904 - - -	1	3	19

Increase in weight.—26 lbs.

Rate of increase per week.—4⅓ lbs.

Tuberculin Test.

March 2nd, 1904. 43 days after the experiment began. Positive reaction. Rise of temperature 1·3° C.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Pharynx.—In the soft palate, on the left side, was a little yellow spot in the mucous membrane. On cutting into this it was found to be part of a small caseous nodule about the size of a large shot.

A similar nodule was found on the right side, in the palatal tissue, near the margin of the tongue.

These nodules were not sharply circumscribed, and would not shell out. They were quite obviously not crypts filled with secretion.

Submaxillary Lymphatic Glands.—On the left side were two rounded glands, each the size of a pigeon's egg (one and a quarter to one and a half inches in length), closely joined together; on section they were found to be rather firm, congested, and mottled all over with irregular yellow caseating areas.

On the right side one gland, about half the size of those on the left, had several caseating foci.

Pharyngeal Glands.—A lymphatic gland, lying next to the hyoid bone on the right side, was normal. Another on the left side was also normal.

The lymphatic glands in the posterior triangle of neck on both sides were normal.

Thymus.—Normal.

Stomach.—The mucous membrane of the pyloric half of the stomach, especially near the lesser curvature, had the appearance of being pitted with innumerable very small ulcers with raised yellow edges (? normal structures.)

Small Intestine.—Normal, unless some rather numerous rounded whitish elevations in the Peyer's patches were early tubercles.

The Large Intestine showed very numerous rounded elevations, with a small central depression (follicles). There was no sign of inflammation or of caseation about them. Similar follicles, not so well developed, were seen in Pigs 34 and 44.

On the caecal side of the ileo-caecal valve were some wide-mouthed follicles, filled with yellowish green contents.

Mesenteric Glands.—Two enlarged glands (the larger 1 in. by ¾ in.) were almost entirely in a state of early caseation. The rest were normal.

A group of glands close to the ileo-caecal valve were rather firm and slightly enlarged, but showed no sign of tubercle.

Colic Glands.—A few glands, lying between the folds of the large intestine, appeared slightly enlarged, congested and hard, and one contained a caseous and softened focus. Others, like the mesenteric glands which were not obviously tuberculous, were very much firmer than the glands of a calf, and were somewhat nodular, white, and translucent.

Omentum. Peritoneum, Liver, Hepatic Lymphatic Glands, *Spleen, Kidneys, Suprarenal Bodies.*—Normal.

Diaphragm, Pleura.—Normal.

Heart.—The right ventricle was entirely filled with a large colourless clot, not adherent to the heart wall, but nevertheless rather firm and opaque. There was a very small quantity of coloured clot in the ventricle.

Pericardium.—Normal.

Lungs.—One little solid nodule, the size of a shot, was removed from near the edge of the base of the left lung for further examination.

The lungs were otherwise normal.

Bronchial Lymphatic Glands.—Normal.

Ovary.—Normal.

Uterus.—Normal.

Two large pudic lymphatic glands were normal.

Other Lymphatic Glands: Right Prescapular, Left Prescapular, Right Precrural, Left Precrural, Right Popliteal, Left Popliteal.—Normal.

Microscopical Examination.

Nodule from Right Palate.—No tubercle bacilli seen.

Nodule from Left Palate.—No tubercle bacilli seen.

Submaxillary Gland (1).—No tubercle bacilli seen.
(2).—No tubercle bacilli seen.

Mesenteric Gland.—No tubercle bacilli seen.

Ovary.—No tubercle bacilli seen.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS. (GUINEA-PIG 878 INOCULATED SUBCUTANEOUSLY.)

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
876	230	E. of Spleen	Killed 68 days	Healthy.
877	200	E. of Mesenteric Gland	Died 21 days	Tuberculosis.
878	230	E. of Submaxillary Gland	Died 63 days	General Tuberculosis.
879	190	E. of Submaxillary Gland	Died 8 days	Slight Tuberculosis (death due to other causes).

PIG 30.

Age—10 weeks.

Fed—Once with tuberculous milk of Cow 64.

Date—January 20th, 1904.

Amount of Milk—1·41 c.c.

Number of tubercle bacilli—1,000,000.

Killed—May 2nd, 1904.

Duration of Experiment—103 days.

Clinical History.

There was no sign of illness during the experiment.

Temperature.

After the first week was slightly raised for four weeks, varying between 38·8° and 40°C.; then, with exception of three or four slight rises, highest 39·7°C., was fairly normal till death.

Weights.

	qr.	lbs.
January 19th, 1904 - - - - -	1	7
May 2nd, 1904 - - - - -	2	0

Gain in weight.—21 lbs.

Average gain per week.—1·31 lbs.

Tuberculin Test.

April 18th, 1904, 89 days after the experiment began. Positive. Rise of temperature, 1·9°C.

April 22nd, 93 days after the experiment began. Positive. Rise, 1·2°C.

April 26th, 97 days after the experiment began. Rise of temperature, 0·4°C.

POST-MORTEM EXAMINATION.

Condition.—Fair.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Pharyngeal Lymphatic Glands, Cervical Lymphatic Glands, Thymus.—Normal.

Abdomen:

Omentum.—The omentum contained some scattered hard translucent tubercles, about the size of pins' heads, most of which were slightly opaque in the centre. In the middle of the omentum there was a small gland filled with caseo-pus.

Mesentery.—On the surface of the mesentery, around its root, there was a series of firm, caseous tubercles, the size of millet seeds, loosely attached to the mesentery by slender congested strands of connective tissue.

Stomach.—The anterior surface of the stomach showed a series of hard pearly grey tubercles 1 to 2 mm. in diameter; near the cardiac end there were two clusters of rather larger nodules, loosely attached to the surface by fibrous tissue strands.

The mucous membrane of the stomach was normal.

Gastric Glands.—Normal.

Large and Small Intestines.—Normal throughout; no sign of ulceration.

Mesenteric Glands.—A gland in the anterior part of the mesentery showed a yellow necrotic focus which had not begun to caseate.

All other mesenteric glands were normal.

Of the group of glands around the termination of the ileum one only, the size of a filbert, was tuberculous; this contained two firm greyish white caseous gritty nodules, one about ½ in., the other ¼ in. in diameter.

The glands in the midst of the coils of the large intestine were normal.

Spleen.—The spleen was not enlarged; on the surface there were a few translucent flattened tubercles from 1 to 2 mm. in diameter; in the substance there were some fifteen nodules, ranging in size from a small shot to a large pea, some of which formed rounded eminences on the surface. On section the nodules consisted of greyish somewhat translucent tissue, in the centre of which small caseous foci were seen; in the largest nodule the central part was distinctly softened; the caseous foci were not appreciably calcareous.

The Liver showed on the surface beneath the capsule very numerous pearly white nodules from 1 to 3 mm. in diameter; the nodules were somewhat irregular in outline; all except a few of the smallest ones showed opaque white caseous gritty central foci; some of the nodules projected slightly on the anterior surface, where they were flattened and slightly mushroomed; similar nodules occurred fairly evenly distributed throughout the substance of the liver.

Growing from the capsule on the anterior surface there were many slender connective tissue filaments.

Portal Glands.—In the lesser omentum there was a group of seven or eight firm glands, ranging in size from a small bean to a walnut; on section all the glands showed scattered throughout their substance irregular yellowish caseo-necrotic areas; in two or three of the larger glands there were firm caseous masses appreciably gritty from calcification.

Three small glands around the cœliac artery showed caseous gritty foci.

Two glands lying on the pancreas, one the size of a broad bean, the other much smaller, showed scattered throughout firm yellowish necrotic areas, in the centres of some of which gritty foci were seen.

Kidneys. Suprarenal Bodies, Lumbar Glands, Iliac Glands.—Normal.

Thorax:

Heart, Pericardium.—Normal.

Lungs.—Scattered throughout both lungs there were numerous grey translucent tubercles, less than a mustard seed in size, some of which were slightly opaque in the centre. There were also a few larger nodules (none larger than a small pea), which had softened and gritty caseous centres; these latter occurred mainly in the caudal lobes.

On the diaphragmatic surface of the right lobe there were several soft vascular connective tissue outgrowths.

The bronchial and mediastinal glands were not enlarged or obviously tuberculous.

Diaphragm.—On the peritoneal surface, mainly on the right side, there were numerous pale firm nodules, ranging in size from a small shot to a wheat grain.

On the pleural surface on the right side there was a number of soft connective tissue processes, at the base of some of which hard translucent tubercles were situated; in the centre of the tendon on this surface a small hard congested loosely pedunculated nodule was seen.

At the three seats of inoculation of tuberculin (two on the inside of the right and one on that of the left thigh) there were slightly raised ring-like thickenings of the skin, covered on the inside by adherent dried secretion; the skin in the centre of the rings was pigmented, but did not otherwise seem to be abnormal.

Inguinal Glands.—These glands were larger and firmer than normal, and on section were œdematous; they were not obviously tuberculous.

Precrural, Popliteal, Prepectoral and Prescapular Glands.—Normal.

Microscopical Examination.

Smears from:

Omental Gland.—No tubercle bacilli.

Ileo-colic Gland.—Numerous tubercle bacilli.

Spleen.—Two tubercle bacilli.

Guinea-pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from an ileo-colic gland, as well as one with an emulsion made from the spleen (one nodule), and one with an emulsion made from the liver, died of general tuberculosis.

PIG 38.

Age—7 to 8 months.

Fed—Once with tuberculous milk of Cow 64.

Date—January 16th, 1904.

Amount of Milk—5·58 c.c.

Number of tubercle bacilli—1,000,000.

Killed—May 3rd, 1904.

Duration of Experiment—109 days.

Clinical History.

The animal remained in good health throughout the experiment.

Temperature.

The temperature rose to 40·2°C. on the 20th day, quickly fell, and remained normal till the end of the experiment.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - - -	1	0	11
May 3rd, 1904 - - - - -	1	3	6

Gain in weight.—79 lbs.

Average weekly gain.—5·6 lbs.

Tuberculin Test.

April 14th, 1904, 89 days after the experiment began Positive. Rise of temperature 1·9°C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils, Pharynx.—Normal.

Submaxillary Glands, Pharyngeal Glands.—Normal in size and appearance.

Cervical Glands.—Normal.

Abdomen :

No fluid in peritoneal cavity.

Omentum, Parietal Peritoneum.—Normal.

Serous Surfaces of Stomach and Intestines.—Normal.

Spleen.—On the surface there were several pedunculated fatty tumours, the largest the size of a pea ; the spleen pulp was normal.

The Liver showed beneath the capsule, embedded in the substance, scattered pearly grey tubercles about the size of a pin's head ; twenty-four were counted on both surfaces. Similar tubercles were sparsely scattered throughout the substance ; some of the tubercles had a lobulated outline ; when cut into all showed minute opaque white points in their centres which were not appreciably gritty.

Portal Glands.—In the lesser omentum there was a group of glands, nine or ten in number, varying in size from a pea to a large filbert ; on section they were all beset with yellowish softened caseous nodules, about the size of a No. 1 shot, which, in the larger glands particularly, had here and there coalesced.

Continuous with the above group there were two or three glands situated around the cœliac axis which showed similar foci.

Two small glands on the pancreas contained, scattered throughout their substance, yellow softened caseous foci.

Kidneys.—The left showed on the surface a depressed cicatrix ; on radial section a fibroid wedge was seen involving the whole thickness of the cortical and medullary zones and containing near the pelvis a small cyst ; the rest of the kidney was normal.

The right was normal.

Suprarenal Bodies.—Normal.

Stomach.—Mucous membrane normal.

Gastric Gland.—Normal.

Small Intestine.—Normal throughout ; no sign of ulceration.

Large Intestine.—Normal.

Mesenteric Glands.—A gland in the anterior part of the mesentery, the size of a chestnut, contained a caseous nodule ¾ in. in diameter ; the nodule had softened chiefly around the periphery, causing an almost complete separation of a firm central portion.

A gland in the middle of the mesentery contained a caseous and softened nodule ½ in. in diameter.

At the terminal end of the mesentery there was an enlarged and indurated gland, which on section was beset with caseous and softened nodules.

Between the end of the ileum and the colon there was a glandular mass the size of a filbert, consisting of two glands which had fused together ; on section the tissue of the glands was practically completely replaced by soft cheesy caseous material.

The glands in the midst of the coils of the large intestine were normal.

Rectal Glands.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—The right middle lobe and the right caudal lobe each contained a grey tubercle, the size of a shot, with a minute central focus of caseation ; in the middle lobe there was also a very minute grey translucent tubercle, just visible to the naked eye.

One of the marginal lobules in the left caudal lobe was somewhat congested and firmer than normal ; when cut into it showed thickened bronchioles, in the interior of which there were numerous slender worms (filariæ) ; with this exception this lung was normal.

Bronchial Glands.—The left contained a caseous and softened nodule ¼ in. in diameter.

One on the right side showed two minute yellow foci.

Mediastinal Glands.—Normal.

Diaphragm.—Normal on both surfaces.

Lumbar Glands, Iliac Glands, Superficial Inguinal, Precrural, Prescapular, and Prepectoral Glands.—Normal.

Microscopical Examination.

Smears from :

Bronchial Gland.—No tubercle bacilli.

Ileo-Colic Gland.—One tubercle bacillus.

Mesenteric Gland.—Two tubercle bacilli.

Cœliac Gland.—Two tubercle bacilli.

GUINEA-PIGS INOCULATED.

SUBCUTANEOUS INOCULATIONS. (GUINEA-PIG 978 INOCULATED INTRAPERITONEALLY.)

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
975	210	E. of Bronchial Gland	Died 56 days	General Tuberculosis.
976	180	E. of Spleen	Killed 58 days	Healthy.
977	230	E. of Ileo-colic Gland	Died 51 days	General Tuberculosis.
978	170		Died 25 days	Tuberculosis.

PIG 22.

Age—10 weeks.

Fed—Once with tuberculous milk of Cow 64.

Date—January 19th, 1904.

Amount of Milk—7·05 c.c.

Number of tubercle bacilli—5,000,000.

Killed—May 9th, 1904.

Duration of Experiment—111 days.

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

During the first four weeks the temperature was irregular, ranging between 38·7° and 40·1° C.; on the fiftieth day the temperature rose to 41·5° as a result of trauma (broken leg), falling in three days to 39·7 C. Subsequently the temperature never exceeded 39·6° C.

Weight.

	qr.	lbs.
January 19th, 1904 - - - - -	1	11
May 9th, 1904 - - - - - -	2	12

Gain in weight.—1 qr. 1 lb.

Average weekly increase.—1·18 lbs.

Tuberculin Tests.

April 18th, 1904. 90 days after the experiment began. Positive. Rise of temperature, 2·0°C.

April 22nd. 94 days after the experiment began. Positive. Rise of temperature 2·3°C.

April 26th. 98 days after the experiment began. Positive. Rise of temperature, 1·0°C.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary Glands.—On the right side there were two enlarged and indurated glands, one an inch in diameter, the other three quarters of an inch in diameter. On section they were firm and tough, very little normal gland tissue remaining; the cut surface of each was just perceptibly gritty and showed irregular greyish white caseous areas, surrounded by zones of faintly rosy grey tissue.

A third gland on this side was normal.

On the left side there were two enlarged glands, one an inch and a half, the other an inch in diameter; on section they resembled the glands on the right side.

Cervical Glands.—On the left side, in the middle of the neck, there was a gland the size of a marble, which on section showed firm reddish grey tissue, with one or two foci of caseation.

On the right side the corresponding glands were normal.

Two glands near the hyoid bone on the left side, one the size of a large pea, the other that of a bean, resembled on section the left cervical gland.

The glands on the opposite side were normal.

Thymus.—Normal.

Abdomen :

The dorsal layer of the great omentum, near the stomach, showed about half a dozen pin-head sized tubercles, with minute central opacities.

On the serous surface of the colon, in contact with the floor of the abdomen, there were numerous caseating nodules 2 to 5 mm. in diameter; similar nodules, some loosely pedunculated, were seen on the surface of the cæcum.

At the cardiac end of the stomach there was a cluster of five nodules loosely attached to the serous coat.

Spleen.—Not apparently enlarged, showed on the surface a flattened translucent nodule, 3 mm. in diameter. In the substance there were six spherical nodules varying from 0·5 cm. to 1·5 cm. in diameter; some of these formed considerable eminences on the surface.

On section they consisted of firm vascular somewhat translucent grey tissue dotted with minute yellow points. In the centre of each nodule there was a softened caseous focus; in the largest nodule this was 5 mm. in diameter, but in the others it was much smaller.

Liver.—The substance was crowded with pearly white nodules ranging in size from a pin's head to a large pea, the majority of which were caseous and softened in the centre; they were irregular in outline and in some places had become confluent.

Portal Glands.—In the small omentum and around the coeliac axis there was a mass of glands, numbering about twenty and weighing together 5 ozs., the smallest $\frac{1}{2}$ in. in diameter, the largest 2 in. by $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. On section they were firm and tough and closely resembled the submaxillary lymphatic glands.

Several small glands similarly affected were found on the pancreas.

Kidneys.—In the substance of the left, beneath the capsule, there were two minute spherical translucent points of doubtful nature.

A similar point was seen in the cortex of the right kidney.

Suprarenal Bodies.—Normal.

Stomach.—Mucous surface normal.

Large and Small Intestines.—Normal. No sign of ulceration.

Mesenteric Glands.—An enlarged gland in the anterior part of the mesentery was caseous for about two-thirds of its extent, and for the remainder beset with yellow foci.

A gland in the middle of the mesentery, the size of an acorn, was almost completely caseous. Another a little further along, and one at the termination of the mesentery, each contained a caseous nodule 1 cm. in diameter, the former showing in addition small necrotic areas which were not caseous.

The caseous degeneration was more advanced in the mesenteric glands than in the cœliac.

One of the glands at the termination of the ileum was slightly enlarged and indurated, and showed on section a necrotic focus.

Colic Glands.—Between the coils of the large intestine there were several slightly enlarged firm glands, which showed small caseous foci, and one which showed a caseous nodule.

Heart, Pericardium.—Normal.

Lungs.—Contained numerous firm nodules, fairly evenly distributed throughout the substance, ranging in size from a small shot to a large pea; all except a few of the smaller ones were caseous and softened in the centre.

Thoracic Glands.—Around the root of the left lung there was a series of five enlarged glands; one, the largest, was grooved by the aorta; on section they were firm, and resembled the submaxillary glands, but were not quite so advanced in caseation and necrosis.

On the right side of the trachea, just in front of the bronchus, there was a group of three glands, the largest the size of a bean, similarly affected.

In the dorsal mediastinum one gland showed a small caseating nodule.

Ventral mediastinal glands (three in number) were slightly enlarged, firm, and in a state of early caseation.

Pleura.—On the right side of the diaphragm, both on the peritoneal and pleural surfaces, there were clusters of firm flattened nodules ranging in size from a mustard seed to a split pea.

On section the tissue of the nodules was pale, firm, and dotted with minute yellow foci. Several of those on the pleural surface were surmounted by soft pinkish connective tissue outgrowths. On each side, over an intercostal space, there was a firm nodule similar to those on the diaphragm.

Uterus, Fallopian Tubes.—Normal.

Precrural, Right Superficial Inguinal, Popliteal, Prescapular, and Prepectoral Glands.—Normal.

At the seat of inoculation of tuberculin, on the inside of the left thigh, there was a dry brown adherent slough, covering an ulcerated area 3 in. by 1 in., involving the whole thickness of the skin ; on cutting through the ulcer, the subcutaneous tissue, and to some extent the adjacent muscle, were seen to be converted into a bright yellow firm necrotic mass, a third of an inch thick ; the necrosed tissue was œdematous, and showed immediately beneath the ulcer a number of little spaces filled with fluid.

The left superficial inguinal gland was enlarged, and contained a pea-sized nodule in a state of early caseation.

Around the upper part of the shaft of the tibia there was a mass of hard callus surrounding an oblique fracture (the leg was accidentally broken on March 8th). The bone was sawn through longitudinally, but no sign of tuberculosis was seen.

Microscopical Examination.

Smears from :

Inguinal Gland.—No tubercle bacilli.

Tuberculin Tumour.—Four tubercle bacilli.

Submaxillary Gland.—One tubercle bacillus.

Spleen.—Three tubercle bacilli.

Cœliac Gland.—No tubercle bacilli.

Mesenteric Gland.—One tubercle bacillus.

Left Bronchial Gland.—No tubercle bacilli.

Guinea-Pigs Inoculated.

Two guinea-pigs, one inoculated with an emulsion made from submaxillary gland, and one with an emulsion made from spleen, died of general tuberculosis.

A guinea-pig inoculated subcutaneously with an emulsion made from the tuberculin tumour was killed after 64 days and found to have general tuberculosis.

PIG 36.

Age—7 to 8 months.

Fed—Once with tuberculous milk of Cow 64.

Date—January 16th, 1904.

Amount of Milk—27·94 c.c.

Number of tubercle bacilli—5,000,000.

Killed—May 10th, 1904.

Duration of Experiment—115 days.

Clinical History.

The animal remained in good health during the experiment.

Temperature.

The temperature rose on the twentieth day to 39·5°C., and on the thirty-third day to 39·8°C. ; it was subsequently practically normal.

Weight.

	cwt.	qrs.	lbs.
January 19th, 1904 - - -	1	1	2
May 3rd, 1904 - - - -	1	3	16

Total gain in weight.—74 lbs.

Average weekly gain.—3·53 lbs.

Tuberculin Test.

April 18th, 1904, 93 days after the experiment began. Positive. Rise of temperature, 1·1°C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Pharynx, Tonsils, Pharyngeal Glands.—Normal.

Submaxillary Glands.—On the left side there were two glands which had fused together ; one was greatly enlarged, and measured 2 in. by 1½ in. by 1¼ in. ; the other was the size of a filbert. On section the large gland was caseous throughout, and for more than three-quarters of its substance converted into a greyish or greenish white soft pultaceous mass ; the capsule was thickened. The small gland was thickly beset with caseous foci. A third gland near the above was normal.

In the right submaxillary region there was a glandular mass measuring 2 in. by 2 in. by 1¼ in. This mass was composed of one large gland and several smaller ones, which were glued to it. The large gland had a thickened capsule and was caseous throughout, but not softened, as in the gland on the opposite side ; the cut surface was distinctly gritty. One of the smaller glands was partly caseous ; another showed scattered caseous tubercles ; two other glands were normal.

Cervical Glands.—On the left side there were two which were slightly enlarged and hardened and which showed on section scattered caseous foci.

On the right side the glands were normal.

Thymus.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Serous surfaces of stomach and intestines normal.

Spleen.—Normal on the surface and on section.

Liver.—Showed beneath the capsule three pearly white tubercles from 1 to 1·5 mm. in diameter ; six similar tubercles were seen deep in the liver substance ; all had minute central caseous foci.

Portal Glands.—In the small omentum there was a series of ten glands, ranging in size from a large pea to a filbert ; several of these had a reddish colour on the surface. On section they were firm, and beset with yellow caseous softened nodules from 1·5 to 3 mm. in diameter ; the glands showed an increase in interstitial connective tissue.

Two or three of the small glands around the pancreas showed similar caseous nodules.

Near the cœliac axis there were two glands, one the size of a broad bean, the other much smaller ; the large one resembled the glands in the omentum ; the small one contained two caseous nodules, gritty from calcification, 3 and 5 mm. in diameter.

Kidneys.—The left was normal on the surface and showed in the substance near the pelvis two large thin-walled cysts filled with clear yellowish fluid.

The right kidney was normal.

Suprarenal Bodies.—Normal.

Stomach.—Mucous membrane normal.

Intestines (large and small).—Normal throughout.

Mesenteric Glands.—All the glands in the anterior two-thirds of the mesentery were enlarged, indurated and nodular. On section two or three of the glands about the middle were practically caseous throughout, the others contained caseous nodules, the smallest 1 cm. in diameter. The caseous masses were definitely circumscribed and were surrounded by a thin wall of fibrous tissue; they were firm, gritty, and were easily shelled out from their capsules.

In the lower third of the mesentery the glands were all normal in size and appearance.

Ileo-Colic Glands.—At the lower end of the ileum there was a mass of firm glands, six in number, joined together by fibrous tissue; they ranged in size from a small bean to a walnut. All, except one, which showed scattered foci, were entirely destroyed by caseation; they were gritty on section and the capsules of the larger glands were thickened.

Between the coils of the large intestine there were three enlarged glands, the largest the size of a broad bean; two of the glands contained caseous nodules (1 cm. and 1·5 cm. in diameter) similar to those in the mesenteric glands; the third (the smallest) contained small softened caseous tubercles.

Lumbar Glands, Iliac Glands.—Normal.

Thorax:

Heart, Pericardium, Parietal Pleura.—Normal.

Lungs.—The left lung contained about a dozen grey translucent tubercles, the largest the size of a shot. In the right lung there were similar tubercles, but more numerous; many of the latter were barely visible to the naked eye. Almost all the tubercles (except the smallest) had opaque yellowish and in some cases gritty central foci.

Bronchial Glands.—On the left side, between the arch of the aorta on the one hand and the trachea and left bronchus on the other, there were five glands ranging in size from a kidney bean to a filbert: on section they were indurated and beset with small softened caseous nodules.

On the right side of the trachea there was a firm gland, the size of a broad bean, which contained similar foci; a similar gland was situated in the angle formed by the bifurcation of the trachea.

Situated on the ventral surface of the trachea, opposite the right bronchus, there were two small glands with caseous foci.

Dorsal Mediastinal Glands.—Normal.

Ventral Mediastinal Glands.—Normal.

On the pleural surface of the diaphragm on the left side there was a hard hemispherical nodule the size of a split pea.

Left Prescapular Gland (on the side of the inoculation of tuberculin) was enlarged and œdematous.

Right Prescapular, Prepectoral, Precrural, Superficial Inguinal and Popliteal Glands.—Normal.

Microscopical Examination.

Smears from:

Mesenteric Gland.—One tubercle bacillus.

Cœliac and Submaxillary Glands.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

ALL SUBCUTANEOUSLY.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
983	250	E. of Spleen	Died 2 days	Acute Infection.
984	220	E. of Liver	Killed 63 days	Healthy.
985	250	E. of Submaxillary Gland	Died 58 days	General Tuberculosis.
986	250	E. of Mesenteric Gland	Died 58 days	General Tuberculosis.

PIG 20.

Age—10 weeks.

Fed—Once with tuberculous milk from Cow 64.

Date—January 19th, 1904.

Amount of Milk—14·1 c.c.

Number of tubercle bacilli—10,000,000.

Killed—May 13th, 1904.

Duration of Experiment—115 days.

Clinical History.

There were no signs of illness during the experiment.

Temperature.

During the first 8 weeks the temperature was irregular, varying between 38° and 40°C., but usually between 38·6° and 39·6°C.; then for 4 weeks it remained below 39° except for two sharp rises to 39·8° and 40·1°; nine days after the last tuberculin test the temperature rose to 41·0°C., but quickly fell.

Weights.

	qr.	lbs.
January 19th, 1904 - - - - -	1	7
May 13th, 1904 - - - - -	1	19

Gain in weight.—12 lbs.

Average weekly gain.—0·85 lbs.

Tuberculin Tests.

April 18th, 1904. 90 days after the experiment began. Positive. Rise of temperature, 1·6°C.

April 22nd, 1904. 94 days after the experiment began. Positive. Rise of temperature, 2·3°C.

April 26th, 1904. 98 days after the experiment began. Slight rise of temperature 0·5°C.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary Glands.—On the right side there was an indurated gland, the size of a broad bean, which on section showed firm irregular greyish red patches containing caseous deposit; two other glands were normal

On the left side there were two small hard glands which on section resembled the tuberculous gland on the right side, but were not so extensively caseated.

The glands on each side near the hyoid bone were slightly enlarged, and on section showed firm greyish red tissue in a state of early caseation.

The superficial cervical glands on each side were similarly affected.

The subparotid and a deep cervical gland on the left side each contained a pea-sized tuberculous nodule, showing minute foci of caseation.

Thymus.—Normal.

Abdomen :

Peritoneum.—On the serous surface of the large intestine, where in contact with the floor of the abdomen, and in the omentum, there were numerous yellowish-white caseous nodules, ranging in size from a pin's head to a wheat grain ; in the omentum they were most numerous near the spleen, where they occurred in groups ; most of the larger nodules were softened in the centre, and all were perceptibly gritty.

Numerous small loosely attached nodules were also seen around the root of the mesentery.

The parietal peritoneum, on the floor of the abdomen, and near the margin of the thorax on the right side, showed several little groups of firm caseous nodules ; on the left side there was a number of minute white thickenings, to which delicate connective tissue filaments were attached.

Liver.—The central part of the anterior surface of the liver was thoroughly adherent to the tendon of the diaphragm ; the rest of the anterior surface was fixed to the muscular part of the diaphragm by numerous slender fibrous filaments. The capsule of the liver was thickened, chiefly on the anterior surface, where it showed patches of dense white fibroid tissue. The liver tissue was pale, lobulation being very distinct. The substance of the liver was closely packed with whitish nodules, irregular in outline, from 1 millimetre up to 2 and 3 millimetres in diameter (generally about 2 millimetres) which in many places had become confluent. All were caseous and softened in the centre, and in some cases gritty. The liver tissue between the nodules was speckled with minute grey points, just visible to the naked eye. The bile ducts were thickened, dilated, and filled with bile stained mucous ; here and there in their interiors small bright green biliary concretions were seen.

Portal Glands.—In the small omentum there was a mass of hard glands (between ten and twelve in number) measuring roughly 2½ in. by 2 in. by 1 in. The glands were matted together and on section were found to be extensively caseated ; the cut surfaces of the glands were perceptibly gritty ; in one or two of the glands the caseous masses appeared to be on the point of breaking down.

Around the cœliac axis there was a similar mass, consisting of fourteen to sixteen glands, the largest of which was 1½ in. by ¾ in. by ⅔ in., the smallest the size of a pea ; these were all in a state of caseation, the larger ones being in a more advanced stage than the smaller.

* *The Spleen* was enlarged, and crammed with firm nodules, varying from 0·5 centimetre to 1·5 centimetre in diameter ; they formed prominent rounded whitish eminences on both surfaces, some projecting half their diameter ; on section they consisted of firm vascular grey translucent tissue, dotted with minute yellow necrotic points ; in the centre of each nodule there was a small softened caseous focus. Scattered over the surface of the spleen were small flattened pearly white nodules.

Kidneys.—The right kidney showed on the surface numerous pale points ; on section some of these were spherical ; others extended through the cortex as radial streaks.

In the left kidney there were a few pale streaks in the cortex of a doubtful nature, but no definite tubercles.

Suprarenals.—In the medulla of the left suprarenal body there was a doubtful greyish tubercle.

The right suprarenal body was normal.

Stomach.—Anterior surface very roughened ; showed scattered nodules, which at the cardiac end occurred in clusters. Mucous surface normal.

Small Intestine, Large Intestine.—Showed no sign of ulceration.

Mesenteric Glands.—In the anterior third of the mesentery there were three glands, which showed softened caseous nodules, 2 to 3 millimetres in diameter ; in the middle third there were four glands which were enlarged, indurated, and caseous throughout ; in the posterior third one gland contained scattered foci, another (the terminal gland) was entirely caseous.

Ileo-Colic Glands.—Five in number, enlarged (the largest 1½ in. long), indurated and matted together, on section, with one exception, they were entirely destroyed by caseation ; the cut surfaces were gritty.

Meso-Colic Glands.—Slightly enlarged and hardened ; two or three contained caseous nodules, 5 mm. in diameter, whilst almost all the rest contained caseous foci.

Lumbar Glands.—Left lumbar gland showed a small caseous focus. Right lumbar gland tuberculous in half its extent.

One left iliac gland showed two or three early caseous foci.

Thorax :

Numerous delicate strands of connective tissue passed from the caudal lobes (mainly from the margins) to the diaphragm and chest wall ; the strands were easily torn through and many showed in the middle small hard caseous nodules.

The fringes along the margins of the lungs, particularly of the caudal lobes, were hypertrophied and contained numerous small firm caseous nodules.

Lungs.—The lungs were closely packed with nodules, chiefly of two sizes ; the smaller and more numerous, varying between 0·5 mm. and 1·5 mm. in diameter, were grey, translucent and slightly opaque in the centre ; the larger were about the size of a pea and were caseous and softened in the centre ; the latter were more numerous in the cephalic lobes, where they formed marked prominences on the surface ; in the caudal lobes several of the larger nodules on the diaphragmatic surfaces showed long connective tissue outgrowths.

Thoracic Glands.—The dorsal mediastinal glands were enlarged and showed caseous deposits in varying amounts ; some were almost entirely tuberculous ; others showed small foci only.

Around the left bronchus there was a series of five enlarged glands which on section showed caseous areas embedded in firm greyish translucent tissue.

The right bronchial glands, three in number, were similarly affected.

Two ventral mediastinal glands, each the size of a walnut, were uniformly hardened and beset with caseous foci.

Diaphragm.—The abdominal surface was profusely covered with flattened nodules, the largest the size of a split pea, which in many places had coalesced ; the nodules were firm grey and translucent and showed caseous gritty foci ; they were more numerous on the right side and occurred also on the pillars of the diaphragm.

Similar, but larger and more prominent, nodules were seen on the pleural surface ; on the tendinous part these had coalesced to form an almost continuous layer of new-formed tuberculous tissue, 5 mm. in greatest thickness ; the surfaces of the nodules were covered with delicate villous vegetations.

Pleura.—Along the margins of the ribs there were numerous mushroomed growths, resembling those on the diaphragm ; they were more numerous on the left side, where they formed along some of the ribs unbroken bands half an inch wide. Groups of nodules were seen on the caval and mediastinal folds of pleura.

Heart.—On the surfaces of the ventricles there were numerous nodules, similar to those on the abdominal surface of the diaphragm ; these were grouped chiefly on the borders of the heart and along the coronary arteries; there were a few nodules along the margins of the auricles, which were fixed by recent adhesions to the ventricles. At the root of the great vessels there were aggregations of small nodules.

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* See Plate 4.

The parietal pericardium showed several plaques of translucent granulations.

Inguinal Glands.—The right superficial inguinal glands were slightly enlarged indurated and nodular; they showed on section tuberculous nodules in a state of early caseation.

The glands on the opposite side showed two small nodules.

Popliteal Glands.—The left popliteal gland contained a minute white focus.

The right popliteal was normal.

Some of the glands near the entrance to the thorax were tuberculous; others were normal.

Prescapular Glands.—The left prescapular gland contained a tuberculous nodule; the right was normal.

Uterus.—Normal.

Microscopical Examination.

Smears from :

Mesenteric Gland *Ventral Mediastinal Gland*	A few tubercle bacilli.

Guinea-Pigs Inoculated.

Two guinea-pigs inoculated with an emulsion made from a mesenteric gland, and one inoculated with an emulsion made from the ventral mediastinal gland died of general tuberculosis.

PIG 42.

Age—9 months.

Fed—Once with tuberculous milk of Cow 64.

Date—January 16th, 1904.

Amount of Milk—55·88 c.c.

Number of tubercle bacilli—10,000,000.

Killed—May 12th, 1904.

Duration of Experiment—117 days.

Clinical History.

No signs of ill-health were noticed during the experiment.

Temperature.

Was practically normal throughout.

Weights.

	cwt.	qrs.	lbs.
January 19th, 1904 - - - -	1	3	5
May 12th, 1904 - - - -	2	3	3

Gain in weight.—3 qrs. 26 lbs.

Average gain per week.—6·48 lbs.

Tuberculin Test.

April 18th, 1904, 93 days after the experiment began. Positive. Rise of temperature 1·7°C.

POST-MORTEM EXAMINATION.

Carcass.—Very fat.

Tongue, Pharynx.—Normal.

Tonsils.—On the surface of the left tonsil there was a slight depression corresponding to two crypts, the mouths of which were somewhat widened; the mucous membrane around had a bluish white appearance; the substance beneath the depression showed a yellowish focus, which did not shell out.

Right tonsil normal.

A gland on the right side, near the hyoid bone, contained a few caseous nodules the size of a shot.

The corresponding glands on the opposite side were normal.

Subparotid Glands, Cervical Glands.—Normal.

Submaxillary Glands.—In the left submaxillary region there were two enlarged glands, one the size of a walnut, caseous in half its extent, the other beset with caseous nodules; the nodules were not softened and were gritty only to a very slight degree. Two other glands in this region were normal.

On the right side there was a large gland, $1\frac{3}{4}$ in. by 1 in. by $\frac{2}{3}$ in., nodular on the surface, and on section practically entirely destroyed by confluent, slightly gritty caseous masses; a second, the size of a broad bean, was indurated and beset at one end with small firm caseous nodules; a third gland was normal.

Thymus.—Normal.

Abdomen :

Omentum.—On the ventral surface of the great omentum there were about half a dozen yellowish nodules, the size of a wheat grain, caseous in the centre.

Parietal and Visceral Peritoneum.—Normal.

Spleen.—Contained one nodule, 4 mm. in diameter, caseous and softened in the centre.

Liver.—On both surfaces beneath the capsule there were scattered pearly white nodules, ranging in size from a mustard seed to a large pea (sixty counted); similar nodules were evenly distributed throughout the substance; all except the smallest were caseous and softened in the centre and in some gritty particles could be detected.

Portal Glands.—In the small omentum there was a group of six or seven indurated and nodular glands, the smallest the size of a small bean, the largest 2 in. by 1 in. by $\frac{2}{3}$ in. On section they showed yellow caseous nodules from 3 and 4 mm. up to 1 cm. in diameter; the nodules were only very slightly gritty, and some showed beginning softening.

Around the cœliac axis there were six glands, the largest the size of a broad bean. On section they were beset with caseous nodules, 2 to 4 mm. in diameter, similar to those in the glands in the small omentum.

Two small glands on the pancreas showed caseous foci.

Kidneys.—The right showed in the cortex a few small cysts distended with clear fluid; otherwise normal.

The left was normal.

Suprarenal Bodies.—Normal.

Stomach.—Normal.

Small Intestine.—Three Peyer's patches about the middle of the intestine showed minute irregular ulcerations; the margins were not raised or injected; but the intestine between the finger and thumb felt slightly thickened at these points; in the substance of the patch near the ulcers one or two whitish foci were seen through the serous coat: these appeared to be enlarged follicles. The lymphoid nodules in many of the patches were enlarged and stood up from the surface.

Large Intestine.—Normal.

Mesenteric Glands.—Distributed at regular intervals in the mesentery there were seven enlarged and indurated glands; one of the glands was caseous almost throughout, the others showed firm caseous nodules, usually about 1 cm. in diameter.

Ileo-Colic Glands.—At the termination of the ileum, there was a group of seven or eight glands, ranging in size from a pea to a walnut; on section the larger glands were caseous throughout, the smaller ones partly caseous.

One mesocolic gland, the size of a large pea, was caseous and beginning to soften.

Thorax:

Heart, Pericardium.—Normal.

Lungs.—The lung tissue showed numerous petechial hæmorrhages. In the left lung, beneath the pleura, there were six tubercles; one, 2 mm. in diameter, opaque in the centre; the others just visible to the naked eye as dark grey points.

Beneath the pleura of the right lung there were three minute dark tubercles.

On section one tubercle was seen in the depth of the lung on the left side; none on the right.

Bronchial Glands.—Anterior to the left bronchus there were three glands; two of these were normal; the third, the largest, contained about half a dozen firm caseating nodules, 3 mm. in diameter.

The right bronchial gland, and one dorsal mediastinal gland, each contained a similar but smaller caseous nodule.

Two small glands on the dorsal surface of the trachea showed caseous foci.

A ventral mediastinal gland was enlarged and hardened and beset with firm caseous nodules about 3 mm. in diameter.

Diaphragm.—On the peritoneal surface of the diaphragm, on the right side, there were about two dozen firm somewhat translucent nodules, some of which contained yellow gritty foci; the nodules were flattened and irregular in outline, the largest being about 7 mm. across.

On the pleura surface there were three or four similar nodules, one of which was surmounted by a soft connective tissue process three-quarters of an inch long.

In the pleura opposite some of the nodules on the abdominal surface there were clusters of translucent tubercles the size of mustard seeds.

The parietal pleura on the left side, over intercostal spaces, showed half a dozen nodules similar to those on the diaphragm.

On the right side the pleura was normal.

Popliteal Glands, Superficial Inguinal, Precrural, Iliac Lumbar, Prepectoral, Right Prescapular.—Normal.

Right Prescapular Gland.—Contained two firm caseating nodules the size of a shot.

Microscopical Examination.

Smears from:

Left Prescapular Gland.—One tubercle bacilli.

Ileo-Colic Gland.—Two tubercle bacilli.

Submaxillary Gland.—Two tubercle bacilli.

GUINEA-PIGS INOCULATED.

All Subcutaneously.

Number of Guinea-pig.	Weight in Grammes.	Material Inoculated.	Duration of Life.	Result.
987	130	E. of Spleen	Died 72 days	General Tuberculosis.
988	160	E. of Ileo-Colic Gland	Killed 77 days	General Tuberculosis.
989	190	E. of Submaxillary Gland	Died 48 days	General Tuberculosis.
990	200	E. of Tonsil	Died 6 days	Acute Infection.

SECOND SERIES OF SPECIAL FEEDING EXPERIMENTS.

After the completion of the first series of special feeding experiments I was directed by the Commission to begin another series, using tuberculous material in smaller dose and, if possible, of a less high degree of virulence.

HISTORY OF THE VIRUS USED IN THE EXPERIMENT.

The virus used in the series was B IV. (Table IV.). This virus was selected because at that time the results obtained in calves by the inoculation of emulsions of fresh material seemed to indicate that here we were dealing with a virus that was not very virulent for the bovine animal.

Subsequent experiments with cultures have shown that the virus is practically equal in virulence to that of the virus used in the first feeding experiment, and that the mild types of disease that resulted in the calves inoculated with fresh material were probably due to the bacilli in the emulsions being in a low condition of vitality.

It was decided that the bacilli used in the experiments should, as in the first series of experiments, be contained in tuberculous milk, the product of an udder artificially infected with tuberculosis.

In order to produce this supply of milk a cow was inoculated with an emulsion made from the local lesion and prescapular gland of Calf 138; the local lesion, as well as the prescapular, was taken because it was feared that an emulsion made from the gland alone would not be sufficiently rich in bacilli; contrary to expectation the emulsion was very rich in bacilli, giving the high total of 12,027,333 tubercle bacilli per cc.; 1·2 cc. of this emulsion diluted to 10 cc., containing approximately 14,670,000 tubercle, were inoculated into each of two quarters of Cow 172 (to compare with Cow 68, which received an equivalent dose).

A month afterwards all that could be detected in the udder was a nodular induration in the right hindquarter at the root of the teat; the left forequarter and the milk had not undergone any appreciable change.

Everything pointed to the development of a chronic disease in the cow, and in order to avoid the delay that would have ensued before the milk became rich enough in bacilli to feed a large series, it was felt to be advisable to inoculate another cow.

The second cow (No. 164) was inoculated with an emulsion made from the tuberculous organs of two guinea-pigs that had been inoculated at the same time as Cow 172 and with some of the same emulsion. The dose of emulsion was so arranged that Cow 164 received the same number of bacilli as Cow 172. Cow 164 developed an acute tuberculosis and died in 47 days. Cow 172 was killed in apparent good health 399 days after inoculation and showed chronic tuberculosis of the udder and nearest glands, one tubercle in each suprarenal and no sign of disease elsewhere.

This case is one of a number in which a more extensive tuberculosis has been produced by the inoculation of tubercle bacilli from the tuberculous organs of guinea-pigs than by the inoculation of an equal number of bacilli taken direct from bovine (chronic) lesions.

GENERAL SCHEME OF THE EXPERIMENT.

The experiment consisted in feeding animals with milk containing tubercle bacilli. A few of the animals, eleven guinea-pigs and seven rabbits, were fed for several days with tuberculous milk, but the great majority were fed with single doses of tubercle bacilli. All the animals were divided equally into young and adult, and in each of the species different doses of tubercle bacilli were employed. Four animals, two young and two adult, in each species were fed with equivalent doses of bacilli, and two of these, a young one and an old one, were killed after an interval of about six weeks, the remaining two being allowed to live for seventeen to nineteen weeks.

The table that follows shows at a glance the total number and kind of animals fed, and their respective doses.

Species.		Number Fed with Estimated Doses of T. B.				Number Fed with unknown doses of T.B.	Total Number of Animals in each Species.
		10,000	100,000	10,000,000	10,000,000		
Calves	5½ to 12½ weeks			2	2		8
	7 months			2	2		
Goats	Young			2	2		8
	Adult			2	2		
Rhesus	Young		2	2			8
	Adult		2	2			
Dogs	Young			2	2		8
	Adult			2	2		
Cats	Young			2	2	2	10
	Adult			2	2		
Pigs	Young	4	2	2	2		18
	Adult	2	2	2	2		
Guinea-Pigs	Young	2	2	2	2	11	27
	Adult	2	2	2	2		
Rabbits	Young	2	3	2		7	20
	Adult	2	2	2			

Method of Feeding.

Milk from the two inoculated quarters of the cow was collected on three or four successive days and placed in an ice-chest; the various daily amounts (which had been kept separate) were then thoroughly mixed and filtered through muslin; a sample of the filtrate was sent to Dr. Eastwood, and an estimate made of the number of tubercle bacilli present.

The milk was never very rich in bacilli, and the cow died before the projected series could be completed. To complete the series, two of the guinea-pigs that had been inoculated with the milk of the cow were killed and their organs emulsified; with this emulsion the remainder of the animals were fed; before administration, the emulsion was mixed with ordinary sterilised milk (except in the cases of some guinea-pigs and rabbits in which the emulsion alone was used).

In the majority of cases the milk was mixed with the ordinary food, but with goats this plan did not answer, these animals refusing to drink milk or to touch dry food moistened with it; in their cases the milk was pipetted on to the tongue, the animals, meanwhile, being held in a natural position with their heads a little raised; this method was very satisfactory, and in no case was any of the milk wasted. The same method was adopted for the young pigs, when the dose was very small, and for some of the rabbits and guinea-pigs.

As will be seen later on, the method is open to the objection that, if the animal struggles, there is a possibility that some of the infected material may be drawn direct into the lungs.

In the lists of guinea-pigs and rabbits the method of feeding is indicated in a separate column.

Disturbing Features in the Series.

In the first place the occurrence in the lungs of the goats and of some of the pigs of parasitic nodules, closely simulating tuberculous nodules, rendered it sometimes almost impossible to be certain that the animal was free from lung tuberculosis; in several cases the nodules were emulsified and inoculated into guinea-pigs without producing tuberculosis. Special features of these nodules are their homogeneity, the absence of caseation and the presence in some of them of thread-like parasites just visible to the naked eye. It was perfectly easy, when the number of the nodules was small and when they had attained the dimensions of a body, 2 mm. in diameter, to distinguish them from nodules formed by the tubercle bacillus, but when they were numerous and small it was impossible to say what proportion, if any, of them was caused by the tubercle bacillus.

A more disturbing feature was the presence of what must be looked upon as spontaneous tuberculosis in some of the guinea-pigs used in the diagnosis of doubtful lesions.

Guinea-pigs were used in many cases to confirm the naked-eye diagnosis; in others, to settle whether a lesion was or was not of a tuberculous nature, e.g., the parasitic nodules in the lungs of the goats and pigs. In some animals it is often very difficult, even after prolonged search, to find tubercle bacilli in smears made from isolated tubercle nodules; particularly is this the case in the pig. In such cases, when the naked-eye appearances are doubtful, and the microscopical examination negative, the result of inoculation into a guinea-pig is very valuable evidence as to the nature of a nodule.

In this way a great number of guinea-pigs was used, and at one time the stock of animals was exhausted. None being available at Blythwood, four dozen were obtained from a dealer in London. The guinea-pigs on arrival appeared quite healthy, and none showed any external evidence of disease; they were used very quickly for experiment, and none were killed as controls.*

All the guinea-pigs exhibiting spontaneous lesions of tuberculosis can be traced to this source.

The organs primarily affected in the contaminated guinea-pigs were the lungs or bronchial glands, and infection appeared to have taken place through the respiratory tract; all guinea-pigs in which the distribution of the tuberculosis has pointed to this channel as the mode of infection have been rejected, and only those guinea-pigs have been accepted as producing evidence of the presence of tubercle bacilli in the tissues inoculated, in which there was a local lesion with tuberculosis of the nearest glands.

CALVES.

Calves of different ages were used, the young ones varying from 5½ to 12½ weeks, the older ones all being about 7 months.

Seven out of eight calves became infected. Four of these showed lesions in the small intestines and in every case the mesenteric glands were affected, and in some the ileo-colic and colic.

Beyond these the disease had made little progress. In three of the calves there were slight lesions in a mediastinal gland (a guinea-pig inoculated from one of the glands did not develop tuberculosis) and in a fourth two nodules in a bronchial gland.

In two calves the liver in each case contained a single tubercle, and in one of these cases there was a small tubercle in a portal gland.

In another calf a portal gland showed tubercles, whilst the liver appeared healthy. In none of the cases were the tonsils or pharyngeal glands affected.

One of the calves, fed with over 10,000,000 tubercle bacilli, showed on post-mortem examination no sign of tuberculosis. This is the only case that can be placed on record of a calf fed with bovine tuberculous material escaping infection. The calf was quite a young animal and received 0·5 cc. of the emulsion of guinea-pig organs mixed with two to three pints of sterilised milk; the fellow calf, an older animal, fed in exactly the same way, developed tuberculosis. The only explanation I can give for this negative result (excluding the possibility that the calf was a specially resistant animal) is that at the time of feeding the animal had diarrhœa; this condition may have caused the bacilli to be hurried too rapidly through the intestines for them to effect a lodgment in the intestinal mucous membrane.

PIGS.

Eighteen pigs were fed, the doses of tubercle bacilli varying from 10,000 to 10·15 million.

Seven of the animals showed no tuberculosis on post-mortem examination; the others developed tuberculosis.

Of the former, two, Nos. 68 and 82, fed with the smallest dose, died prematurely, and these were subsequently replaced by feeding two other pigs with some of the emulsion made from the guinea-pigs' organs containing approximately the same number of tubercle bacilli. The two latter pigs when killed were found to be free from tuberculosis.

Two pigs, No. 46 (young) and No. 76 (adult), fed with large amounts of tuberculous milk when killed, 44 days after feeding, were also found to be free from any signs of tuberculosis.

I am quite unable to offer any explanation of this result. The milk was collected in the usual way and was treated in exactly the same manner as the milk collected on other days; it was not very rich in bacilli, and although a large quantity (840 cc.) had been collected, only these two animals could be fed; each pig received 420 cc. mixed with their meal, and in each case the whole was satisfactorily eaten up.

Pig 70, fed with 1·36 cc. of milk with a pipette (dose 100,000 tubercle bacilli) also showed no definite tuberculous lesions; there was a small focus of pus in a gland near the articulation of the jaw, but no tubercle bacilli were found in a smear preparation.

Seven of the eleven pigs which became tuberculous were adults, and in five of these the disease in the period of observation had not extended beyond the nearest glands; in the other two there was a slight extension to the liver and portal glands. The other four pigs were younger animals; three of these were extensively tuberculous, two, Nos. 54 and 48, dying of the disease in 49 and 89 days respectively; the other, No. 74, showed in 42 days early caseation of the submaxillary and pharyngeal glands, two tubercles in the liver and ten in the lungs.

These results show clearly that as the pig grows older it becomes much more resistant to tuberculosis.

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* The possibility of the occurrence of spontaneous tuberculosis in the guinea-pig was overlooked; at Walpole more than a thousand guinea-pigs had been used for inoculation, and none with the exception perhaps of two guinea-pigs inoculated with milk of Cow 44, on *post-mortem* examination showed any evidence that they had been previously infected.

Pigs 48 and 80, for example, both young pigs, were most severely affected, whilst the corresponding old pigs showed after the same interval of time only a very mild type of disease. In the former animals the extensive implication of the lungs and pleura was a very striking feature. In both cases the bacilli gained entry through the tonsils (possibly in Pig. 80 through the intestinal mucous membrane as well, but without producing lesions).

These two were the only two pigs out of eleven infected animals to show tuberculosis of the tonsils, and in none was there disease of the intestinal mucous membrane, although the mesenteric glands (including ileo-colic) were affected in eight instances.

Pig 54, one of the young animals mentioned above, died in 49 days of severe tuberculous pneumonia, and with the exception of a submaxillary gland which contained three tubercles the alimentary tract and glands in connection with it were free from disease.

This pig was fed by means of a pipette; it struggled violently during the feeding, and some of the milk placed upon its tongue trickled from its mouth; it was estimated that not more than half the dose (100,000 tubercle bacilli) was retained. There is not much doubt that whilst the animal struggled some of the milk was drawn straight into the lung alveoli, and so caused a primary tuberculosis of the lungs.

The same explanation has been offered in the cases of several rhesus monkeys, and must be offered for two rabbits fed in the same manner, in which there was extensive lung tuberculosis without disease of the alimentary tract or glands in connection with it.

The type of disease in all these cases was that of a tuberculous pneumonia, and this supports the hypothesis that the bacilli gained access to the lungs directly, and not by first passing through the alimentary mucous membrane; had the latter been the mode of infection we should have expected to find single tubercles or nodules more or less evenly distributed throughout the lung substance.

May not the mode of infection by insufflation have its place in the causation of the tuberculous diseases of man? The above experiments prove that only a very small number of bacilli are required to produce infection in this way, so that it does not seem to be unreasonable to attribute some of the cases of bronchial gland disease in children, and possibly some of the cases of tuberculous broncho-pneumonia to milk containing tubercle bacilli being accidentally inhaled, through "going the wrong way" or during a fit of coughing.

GOATS.

Eight goats were fed, four with 1,000,000 bacilli and four with 10,000,000 bacilli. One of the goats, an adult, fed with 1,000,000 tubercle bacilli remained healthy; the rest developed tuberculosis.

An interesting feature in this species was the frequency (in five cases out of seven) with which the gastric glands were affected; in one of these cases a typical tuberculous ulcer was found in the stomach. The mesenteric glands were tuberculous in two instances only, and in no case was there disease of the intestinal mucous membrane. The tonsils were definitely tuberculous in one case; in another one tonsil was slightly enlarged but without caseation.

Except in the cases of Goats 18 and 26, which showed an equal amount of disease, all the young goats were more severely affected than the adults; this was especially well-marked in the case of Goat 20; the latter animal was killed when very ill, 12 days after feeding, and was found to have fairly extensive general tuberculosis; the corresponding old goat (No. 24) showed a tuberculosis which was arrested in the pharyngeal and gastric glands.

MONKEYS.

The result of the experiments on rhesus monkeys was unexpected. Eight were fed, and in one only were there lesions suggestive of tuberculosis.[*] In this animal a few yellow nodules were found in the liver which were not, from their appearance, considered to be tuberculous. Smear preparations made from the contents of one of the nodules showed no tubercle bacilli, yet a guinea-pig inoculated with an emulsion made from two of the nodules developed tuberculosis.

A culture, isolated from the guinea-pig, had the cultural characters of the virus inoculated.

CATS.

Eight cats were fed with tuberculous milk containing estimated doses of tubercle bacilli and two with milk to which 12 c.c. of an emulsion made from the tuberculous organs of G.P. 1082 (inoculated with milk of Cow 164) had been added.

Two of the adult cats, Nos. 2 and 16, remained healthy. Cat 4, another adult, showed a condition in the lungs which was probably the result of an antecedent tuberculosis; a guinea-pig inoculated from one of the nodules became tuberculous, and a pure culture was isolated from one of its glands; the bacillus grows poorly on glycerinated serum, glycerin agar, potato and broth, and is classed with the bovine viruses which grow with most difficulty on these media.

In the remaining seven cats there was disease of the lymphatic glands in connection with the alimentary tract, beyond which, except in one case in which a tubercle was found in the liver, the disease had not spread; only two of the cats (both kittens) showed lesions in the small intestine at the site of entry of the bacillus. In Kitten 12 there were some doubtful foci in the lungs; sections of the lung showed the alveoli at these points filled with catarrhal cells and leucocytes; there were no tubercle bacilli or histological structure suggestive of tuberculosis.

DOGS.

Eight dogs were fed, four—two young and two adult—with tuberculous milk from Cow 164 (dose 1,000,000 tubercle bacilli each), and four—two young and two adult—with milk to which some of the emulsion of the tuberculous organs of guinea-pigs had been added (dose in each case, 10,150,000).

Three of the puppies developed tuberculosis of the mesenteric glands without visible lesions in the intestinal mucous membrane; in one of these puppies tubercles, in which tubercle bacilli were demonstrated in smear preparations, were found in the lungs; in the other two puppies a few foci, resembling tubercles, were seen in the lungs, but in neither case could tubercle bacilli be discovered in smear preparations; paraffin sections of the lung of Dog 14 showed these foci to consist of a collection of epithelioid cells with no giant cells, lymphoid cells or tubercle bacilli.

Three out of the four adult dogs were unaffected; in a fourth a pharyngeal and the ileo-colic glands were affected, and in these glands the disease appeared to be arrested.

GUINEA-PIGS.

Seventeen guinea-pigs were fed with single doses, and out of these four only became infected. The failure to infect in so large a proportion of animals may be due partly to the method of feeding adopted; in about half of the cases the milk was mixed with the ordinary food; this consisted of bran, chopped hay, and mangel. In almost all these cases the whole of the food was not completely eaten up, a small residue being left, and it is possible also that some of the food was scratched out of the trough and lost in the bedding; the number of tubercle bacilli therefore placed opposite each of these guinea-pigs cannot be taken as representing the total number ingested.

In those animals fed with a pipette the conditions are different; the milk (or emulsion) was carefully pipetted into their mouths, and in no case was there reason to think at the time that the material so placed was not all swallowed.

Eight of the guinea-pigs were fed by mixing tuberculous milk with the ordinary food, and of these not one became infected. Nine were fed with a pipette and four developed tuberculosis. It will be noticed that three of these four showed no disease of the intestines or mesenteric glands, infection having taken place through the upper part of the alimentary tract. This fact makes it appear probable that the fluid placed in the mouths of the animals was not in reality swallowed, but was retained in and perhaps absorbed from the buccal cavity. This could easily occur, seeing that the dose in these cases was very small, namely 0·5 c.c.

In the other guinea-pig that became infected the dose was larger, *i.e.*, 2·8 c.c., and it follows that most of this must have been swallowed, since so much could not have been absorbed from the mouth. This animal showed a small yellow spot in the lower end of the ileum and an ileo-colic gland was affected.

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[*] Two calves and one puppy fed at the same time and with some of the same milk developed tuberculosis, so that there is no doubt that the milk was virulent.

The fact that thirteen out of the seventeen guinea-pigs remained healthy, although exposed to the chance of infection, shows that the ingestion of small numbers of tubercle bacilli is not necessarily followed by tuberculosis; in most of the cases some tubercle bacilli must have been taken up with the food, and these must have passed through the alimentary tract without being absorbed by the alimentary mucous membrane, or if absorbed in small numbers, possibly destroyed. Guinea-pigs would therefore appear to be less liable to infection than pigs in which tubercle bacilli seem to be readily absorbed.

There are experiments to show that guinea-pigs, even when continuously exposed for several days to infection, may yet escape contracting the disease.

In the list of guinea-pigs the abstracts of the post-mortems of eleven animals that have been fed for several days with tuberculous milk have been included: eight of these were fed for 31 days with tuberculous milk of Cow 172, and of these three were perfectly healthy when killed.

This series of eight is of interest chiefly because four of the guinea-pigs (Nos. 1133, 1134, 1135, and 1136) were fed from birth on meat and milk, whilst the other four were given their ordinary vegetable food. The object of the experiment was to see whether diet would have any influence on infection, and whether a susceptible animal like the guinea-pig could be made to acquire the relatively higher resistance of the carnivorous animal.

Two of the guinea-pigs brought up on meat and milk remained healthy, and the two that became infected showed no disease of the alimentary mucous membrane.

Of those fed with their ordinary diet only one escaped infection.

Three guinea-pigs were fed for six days with milk of Cow 164. In all of these there were lesions in the large and small intestines, and the glands in the neck, the abdominal and thoracic lymphatic glands, and the liver, spleen, and lungs were all severely affected; in one case there was a tubercle in one kidney, and in another small tubercles on the omentum and mesentery.

RABBITS.

Thirteen rabbits were fed with single doses of tubercle bacilli. Four of these were fed with a pipette and one with the stomach tube: in the remainder the milk was mixed with the ordinary food as in the guinea-pigs. Two of the rabbits fed with a pipette were found on post-mortem examination to have primary tuberculosis of the lungs and secondary tuberculosis of the bronchial glands and kidneys.

These two cases have already been mentioned, the distribution of the disease being ascribed to insufflation of the material at the time of feeding.

Only one of the eight rabbits fed with milk mixed with the ordinary food became tuberculous; in this animal, killed 43 days after feeding, there were two foci in the small intestines and numerous caseous foci in the mesenteric glands, but no disease elsewhere.

One rabbit fed with the stomach tube remained healthy.

Seven rabbits were fed for several days with tuberculous milk. Four of these were fed with milk of Cow 172 for 31 days, and three with milk of Cow 164 for 6 days.

Of the former series one killed 111 days after the experiment began was perfectly healthy, whilst the rest became tuberculous.

Of the latter series one died 6 days after the experiment began; the other two, killed 70 and 95 days after the experiment began, were found to have general tuberculosis. In all the rabbits that developed tuberculosis (excluding the two in which the bacilli were inhaled) the small intestines and mesenteric glands showed lesions.

The subsequent course of the disease in rabbits differs in important respects from that in guinea-pigs.

In rabbits the lungs and kidneys in cases of general tuberculosis are always more severely affected than the liver and spleen; often no tubercle nodules can be found in the latter organs. This peculiarity is noticed in subcutaneous inoculations, and also in intraperitoneal inoculations when the dose is small.

In guinea-pigs, on the other hand, the spleen and liver are almost always more severely affected than the lungs and kidneys; in twelve infected guinea-pigs the kidneys showed lesions in two cases only.

GENERAL SUMMARY.

Racial Susceptibility.

The young pig is undoubtedly the most susceptible to tuberculosis of all the larger animal species used in this series.

Goats appear to be more susceptible than calves, but less susceptible than pigs.

Calves are readily infected, but a considerable resistance is offered to the spread of the disease from the mesenteric glands.

In guinea-pigs and rabbits infection by the bovine tubercle bacillus is invariably followed by general tuberculosis which in the end would lead to the death of the animal.

Dogs and cats are not readily infected when small doses are given; lesions may be produced in the mesenteric or pharyngeal glands, but the bacilli show little tendency to infect distant organs.

Influence of Age.

In the majority of the species (*i.e.* in pigs, goats, dogs and cats) age has exercised an important influence on the resulting disease, the adult almost always showing a less severe type of disease than the young. This influence is very marked in the pig which, as it grows older, becomes much more resistant, acquiring a quite remarkable power of limiting the spread of the disease. The fact that adult pigs fed with so small a number of tubercle bacilli as 10,000 showed tuberculous lesions makes it appear probable that the increased resistance is due rather to increased resistance of the tissues than to lessened absorption of bacilli.

In rabbits, guinea-pigs and monkeys the experiments yield no information as to the influence of age.

Course of Infection.

The experiments show conclusively that tubercle bacilli can pass through the mucous membrane of the alimentary tract without producing lesions at the site of entry. Out of fifty-four infected animals in which this was the portal of entry only twenty-two showed lesions of the mucous membrane of the alimentary tract.

There is no evidence however in these experiments that bacilli can pass through the lymphatic glands that drain the alimentary mucous membrane and infect distant organs primarily.

The lungs were often the most severely affected organ in the body, but (excluding those cases in which there was probably direct infection of the lungs) a lesion was always present in the alimentary mucous membrane or nearest glands.

ANALYSIS OF THE POST-MORTEM RESULTS.

Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Sites of Entry.			Nearest Lymphatic Glands.					Lungs.	Thoracic Glands.	Spleen.	Liver.	Portal Gland.	Kidneys.	Diaphragm.	Serous Surfaces.	
				Tonsils.	Intestines.															
					Small.	Large.	Submaxillary Glands.	Pharyngeal.	Mesenteric.	Ileo-colic.	Colic.								Peritoneum.	Pleura.
Calf 194 - - -	5½ weeks	1,000,000	43 days						+				? One tubercle in a mediastinal gland. G.P. killed healthy.						?	
Calf 188 - - -	7 months	1,000,000	44 days						+		+									
Calf 198 - - -	2 months	10,000,000	44 days		+				+	+						+				
Calf 186 - - -	7 months	10,000,000	43 days		+				+	+	+		+ One mediastinal gland.		+					
Calf 200 - - -	7 weeks	1,000,000	127 days						+				+ One nodule in a mediastinal gland.							
Calf 190 - - -	7 months	1,000,000	126 days		+				+				+ Left bronchial.							
Calf 192 - - -	12½ weeks	10,150,000	133 days																	
Calf 182 - - -	7 months	10,150,000	135 days		+				+						+	+				

ANALYSIS OF THE POST-MORTEM RESULTS—*continued.*

Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Sites of Entry.		Nearest Lymphatic Glands.														Serous Surfaces.		
				Tonsils.	Intestines.	Submaxillary Glands.	Pharyngeal.	Cervical.	Mesenteric.	Ileo-colic.	Colic.	Lungs.	Thoracic Glands.	Coeliac.	Spleen.	Liver.	Portal Glands.	Kidneys.	Diaphragm.	Peritoneum.	Pleura.	Peripheral Lymphatic Glands.
Pig 68	9½ weeks	10,000	8 days																			
Pig 52	16 weeks	10,000	26 days																			
Pig 82	7–8 weeks	10,000	43 days																			
Pig 58	6-7 months	10,000	43 days						+													
Pig 70	9½ weeks	100,000	42 days																			
Pig 56	6-7 months	100,000	43 days						+	+												
Pig 54	16 weeks	100,000	49 days			+						✚	✚ (bronchial)		+	? +		+	+		+	
Pig 62	6-7 months	100,000	51 days						+	+												
Pig 74	9½ weeks	1,000,000	42 days			+	+					+				+						
Pig 64	6-7 months	1,000,000	42 days							+		?										
Pig 46	16 weeks	8,539,860	44 days																			
Pig 76	15 months	8,539,860	44 days																			
Pig 84	7–8 weeks	10,000	131 days																			
Pig 60	6-7 months	10,000	120 days							+												
Pig 48	16 weeks	1,000,000	89 days	+		✚	+					✚	+	+	+	✚	+		+	+	+	+ precrural
Pig 66	6-7 months	1,000,000	90 days							+						+	+					
Pig 80	7–8 weeks	10,150,000	131 days	+		✚	✚	✚	+		+	✚	✚	+	+	✚	✚	+	✚	✚	✚	+
Pig 78	15 months	10,150,000	132 days						+			?				?	+					

Crosses with heavy lines indicate severe infection.

ANALYSIS OF THE POST-MORTEM RESULTS—*continued.*

Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Sites of Entry. Tonsils.	Sites of Entry. Intestines.	Nearest Lymphatic Glands. Submaxillary Glands.	Nearest Lymphatic Glands. Pharyngeal.	Nearest Lymphatic Glands. Cervical.	Nearest Lymphatic Glands. Gastric.	Nearest Lymphatic Glands. Mesenteric.	Nearest Lymphatic Glands. Colic.	Lungs.	Bronchial Glands.	Mediastinal Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Diaphragm.	Peritoneum.	Pleura.
Goat 16 - -	10½ weeks	1,000,000	44 days -							+											
Goat 12 -	1 year 10½ weeks	1,000,000	44 days -																		
Goat 18 - -	11 weeks	10,150,000	45 days -						+												
Goat 26 - -	Adult -	10,150,000	45 days -						+												
Goat 14 - -	10½ weeks	1,000,000	130 days						+	+		+		+		+	+				
Goat 22 - -	Adult -	1,000,000	129 days				+					? G.P. became tuberculous	+	+		+					
Goat 20 - -	2¼ months	10,150,000	132 days	✚	Ulcer in Stomach)	+	+	+	+			✚	? +	+	+	+					
Goat 24 - -	2 years -	10,150,000	133 days	? +			+		+												

ANALYSIS OF THE POST-MORTEM RESULTS—*continued.*

				Site of Entry.			Nearest Lymphatic Glands.												
					Intestines.													Serous Surfaces.	
Animal.	Age.	Number of Bacilli.	Duration of Experiment.	Tonsils.	Small,	Large.	Submaxillary Glands	Pharyngeal.	Mesenteric.	Ileo-colic.	Colic.	Lungs.	Thoracic Glands.	Spleen.	Liver.	Kidneys.	Diaphragm.	Peritoneum.	Pleura.
Cat 6 - -	Kitten -	1,000,000	42 days -		+					+									
Cat 2 - -	Adult -	1,000,000	43 days -																
Cat 18 - -	Kitten -	10,150,000	46 days -		+				+	+					+ one tubercle				
Cat 16 - -	Adult -	10,150,000	46 days -																
Cat 8 - -	Kitten -	1,000,000	131 days							+									
Cat 4 - -	Adult -	1,000,000	130 days									+							
Cat 20 - -	Kitten -	10,150,000	137 days						+										
Cat 14 - -	Adult -	10,150,000	137 days		?				+										
Cat 12 - -	Kitten -	Not known	221 days						+	+									
Cat 10 - -	Young Adult	Not known	220 days					+	+										
Dog 12 -	Puppy -	1,000,000	41 days -																
Dog 6 - -	Adult -	1,000,000	43 days -																
Dog 16 - -	Puppy -	10,150,000	44 days -						+			+							
Dog 22 - -	Adult -	10,150,000	44 days -									?							
Dog 14 - -	Puppy -	1,000,000	127 days						+			?							
Dog 8 -	Adult - over 7 yrs.	1,000,000	129 days																
Dog 8 - -	Puppy -	10,150,000	135 days						+			?							
Dog 20 - -	Adult -	10,150,000	136 days					+		+									

ANALYSIS OF THE POST-MORTEM RESULTS—*continued*.

Animal.	Initial Weight in grammes.	Number of bacilli or duration of Feeding.	Duration of experiment.	Sites of Entry.			Nearest Lymphatic Glands.																
				Pharynx.	Intestines.																		
					Large.	Small.	Submaxillary Glands.	Submental Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-Colic Glands.	Colic.	Lungs.	Bronchial Glands.	Mediastinal Glands.	Coeliac.	Spleen.	Liver.	Portal Gland.	Kidneys.	Omentum.	Pleura.	Peripheral Lymphatic Glands.
Guinea-Pig 1180 -	940	10,150,000	42 days				+	+						+					+				
„ 1154 -	160	100,000	55 days (died)		+		✚	✚	+		+		+	+			✚	✚	✚				+
„ 1174 -	200	10,150,000	71 days				✚	✚					✚	✚	✚	+	+	✚					+
„ 1173 -	1,000	10,150,000	59 days				✚	+	+				+	+		+	✚	✚	✚				
„ 1134 -	700	31 days	70 days				✚	+	+	+	✚	+	+	+			+	+	✚				
„ 1138 -	660	31 days	70 days				+		+	+	+			+			+	+	+				
„ 1136 -	620	31 days	146 days (died)				+	+	+				+	+	+	+	✚	✚	✚				
„ 1140 -	320	31 days	147 days (ill)		+ (large)		✚	✚	✚	+	✚		✚	✚	+		✚	✚	✚	+	+	+	+
„ 1139 -	750	31 days	165 days		+		✚	✚	✚	✚	✚	+	+	+	+	✚	✚	+	✚		✚		
„ 1157 -	260	6 days	70 days		+	+		+		✚	✚	+	+	+		✚	+	✚	✚				+
„ 1158 -	220	6 days	84 days		+	+	+	+	+	✚	✚		+	+	+	✚	✚	✚	✚		+		
„ 1156 -	350	6 days	102 days		+	+	✚	✚	✚	✚	✚	+	✚	✚	✚		✚	✚	✚	+			

Only the Guinea-pigs that became tuberculous are included in this table.

Analysis of the Post-Mortem Results—*continued.*

				Sites of Entry.		Nearest Lymphatic Glands.												
Animal.	Initial Weight in Grammes.	Number of Bacilli or duration of Feeding with Milk.	Duration of Experiment.	Intestines.		Submaxillary Glands.	Cervical Glands.	Mesenteric Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Gland.	Kidneys.	Omentum.	Peripheral Lymphatic Glands.	Diaphragm.
				Small.	Large.													
Rabbit 77 - - -	260	10,000	44 days							+	+				+			
Rabbit 71 - - -	3,160	10,000	44 days							+	+				+			
Rabbit 67 - -	1,310	1,000,000	43 days	+				+										
Rabbit 89 - - -	400	31 days	70 days	+	+			+		+	+				+	+		
Rabbit 91 - - -	1,300	31 days	70 days	+				+		✚	+				✚	+		
Rabbit 92 - - -	1,140	31 days	111 days	+				+		✚	✚	+			✚	+	+	
Rabbit 95 - - -	720	6 days	70 days	+	+	+		+		✚	+	+	+		✚	✚		+
Rabbit 96 - - -	720	6 days	95 days	+				+		✚	✚	+	?	+	✚	+	+	

CALF 194.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Weight—July 19th, 1904, 3 qrs. 21 lbs. [Age—5½ weeks.]

Killed—August 26th, 1904. 43 days after the experiment began.

Clinical History.

There were no signs of illness during the experiment, and the temperature remained normal throughout.

Weights.

	qrs.	lbs.
July 19th, 1904 - - - - -	3	21
August 26th, 1904 - - - - -	3	25

Gain in weight.—4 lbs.

Average weekly increase.—0·75 lbs.

Tuberculin Test.

August 24th, 1904. 41 days after the experiment began.—Rise of temperature 0·2° C. Moderate local reaction.

POST-MORTEM EXAMINATION.

Carcass.—In moderate condition.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Retropharyngeal Glands, Parotid Glands, Cervical Glands.—Normal.

Abdomen :

The peritoneal cavity contained an excess of serous fluid. On the peritoneum covering the floor of the abdomen there were about half a dozen hard pearly tubercles each the size of a pin's head. In addition there were numerous exceedingly minute transparent granules which could not be felt, and which were only visible in a certain light.

Omentum.—Normal.

Small Intestine.—Perfectly normal throughout.

Large Intestine.—Under the mucous membrane of the large intestine there were a few parasitic nodules.

Mesenteric Glands.—At the junction of the middle and posterior thirds of the mesentery there were two glands situated opposite each other on either side of the mesentery, each of which contained a firm nodule, in one case 5 mm., in the other 10 mm. in diameter. On section the nodules were seen to be in a state of early caseation, the caseous foci having a pinkish appearance, due to numerous little points of congestion.

Gastric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Spleen.—4½ ozs. Normal on the surface and on section.

Liver, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—Showed several patches of collapse, affecting whole lobules and groups of lobules ; the patches were more numerous in the cephalic lobes. The bronchi leading to the collapsed areas contained muco-pus, but no parasites were seen.

Thoracic Glands.—In the dorsal mediastinal gland, above the bifurcation of the trachea, there was a pearly white spherical tubercle, the size of a small pin's head.

Other mediastinal and the bronchial glands were normal.

The tissues at the seat of inoculation of tuberculin, on the right side of the neck, were swollen and œdematous.

Right Prescapular Gland.—Measured 2¼ in. by 1 in. by ½ in., and was very œdematous and in parts hæmorrhagic.

Left Prescapular Gland.—Measured 1½ in. by ½ in. by ⅓ in.

Lumbar Glands, Cœliac Glands, Iliac Glands, Precrural Glands, Pubic Glands, Popliteal Glands, Gluteal Glands, Prepectoral Glands, Axillary Glands.—Normal.

Testicles.—Normal.

Microscopical Examination.

Smear from :—

Mesenteric Gland Emulsion.—Numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in grammes.	Material Injected.	Duration of Life.	Result.
1197	280	E. of Spleen.	Killed 79 days.	Healthy.
1198	200	E. of Mesenteric Gland.	Died 23 days.	General Tuberculosis.
1199	210	E. of Mediastinal Gland.	Killed 80 days.	Healthy.

CALF 188.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Weight—July 19th, 2 cwts. 2 qrs. 14 lbs. [Age—about 7 months.]

Killed—August 27th, 1904. 44 days after experiment began.

Clinical History.

There were no signs of illness during the experiment.

Temperature.

The temperature rose slightly on the thirty-second day to 39·7° C. It remained about this level for three days, then returned to the normal.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - - -	2	2	14
August 27th, 1904 - - - - -	2	3	9

Gain in weight.—23 lbs.

Average weekly increase.—4·6 lbs.

Tuberculin Test.

August 24th. 41 days after the experiment began.—Positive. Rise 0·9° C. Considerable local œdema.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Parotid Glands, Retropharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

The peritoneal cavity contained about 50 cc. of serous fluid.

Intestines (*Large and Small*).—Normal throughout.

Gastric Glands.—Normal.

Mesenteric Glands.—At the junction of the anterior and middle thirds of the mesentery there was an enlarged and indurated gland, the size of a small hen's egg. On section it showed a tuberculous mass, 3 by 2·5 by 2 cm., well advanced in caseation, and replacing more than half the gland substance. Near this gland, on the opposite side of the mesentery, a second gland showed two firm caseating nodules, one 1 cm. in diameter, the other 2 by 1·5 cm.

At the junction of the middle and posterior thirds there was an enlarged gland, containing a mass 2 by 1·5 cm., which on section showed irregular patches and foci of caseation, embedded in a greyish translucent matrix.

Most of the caseated patches had a rosy tint, due to numerous little points of congestion.

In none of the nodules was there any sign of softening or calcification.

The rest of the mesenteric glands, although slightly larger than usual, showed no sign of tuberculosis.

Ileo-colic Glands.—Normal.

Colic Glands.—One connected with the early part of the colon showed scattered throughout the substance little yellow caseous foci; the gland tissue surrounding these foci was slightly indurated.

All other colic glands were normal.

Spleen.—Twelve ozs. Normal.

Liver, Portal Glands, Kidneys, Suprarenal Bodies,—Normal.

Thorax :

Heart, Pericardium, Pleura, Lungs, Thoracic Lymphatic Glands.—Normal.

The subcutaneous and muscular tissues around the site of inoculation of tuberculin, on the right side of the neck, were greatly thickened and œdematous. The œdematous infiltration extended into the subcutaneous tissues of the dewlap, which at one part were over 3 in. thick.

Right Prescapular Gland.—2 in. by 1 in. by ½ in. slightly œdematous and hæmorrhagic.

The *left prescapular* and *axillary glands* were also slightly œdematous.

Cœliac, pancreatic, lumbar, iliac and all the superficial glands were normal.

Testicles.—Normal.

Microscopical Examination.

Smears from :—

Mesenteric Gland.—Numerous tubercle bacilli.

Ileo-Colic Glands.—A few tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in grammes.	Material Injected.	Duration of Life.	Result.
1200	150	E. of Spleen.	Killed 97 days.	Healthy.
1201	140	E. of Mediastinal Gland	Killed 97 days.	Healthy.
1202	130	E. of Mesenteric Gland.	Died 26 days.	General Tuberculosis.

CALF 198.

Fed—Once with tuberculous milk of Cow 164.

Date—July 26th, 1904.

Amount of Milk—282 cc.

Number of tubercle bacilli—10,000,000.

Weight—August 2nd, 1904, 3 qrs. 0 lbs. [Age—2 months.]

Killed—September 8th, 1904. 44 days after the experiment began.

Clinical History.

The calf remained in good health during the experiment.

Temperature.

With the exception of a sharp rise to 39·9° C. on the eighth day, the temperature was normal thorughout.

Weights.

	cwt.	qrs.	lbs.
August 2nd, 1904 - - - - -	0	3	0
September 8th, 1904 - - - - -	1	0	22

Gain in weight.—1 qr. 22 lbs.

Average weekly increase.—9·1 lbs.

Tuberculin Test.

September 5th, 1904.—41 days after the experiment began. Positive, rise of temperature 2·4° C. Good local reaction.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Parotid Glands, Cervical Glands.—Normal.

Retropharyngeal Glands.—Were slightly enlarged œdematous and congested, but showed no tubercles.

Abdomen :

There was a small quantity of clear serous fluid in the peritoneal cavity.

Omentum, Peritoneum.—Normal.

Small Intestine.—Nine feet from the pylorus a Peyer's patch showed a slightly raised flattened eminence, 1 cm. in diameter, the mucous membrane over which was congested ; in the centre there was a little ulcer filled with soft whitish caseous debris ; on section the submucous tissue showed a narrow line of caseation.

In the early part of the ileum a Peyer's patch showed an ulcer 5 mm. in diameter extending through the mucous membrane ; the floor of the ulcer was pale and presented little points of congestion ; in the lymphoid tissue immediately surrounding the ulcer, as well as in other parts of the patch, little caseous foci were scattered about. On the peritoneal aspect of the ulcer there were three minute transparent tubercles.

The long Peyer's patch showed near the ileo-cæcal valve a minute ulcer in the centre of a slight elevation ; on section the base of the ulcer was thickened and studded with caseous foci, which were seen in the muscular as well as in the submucous coat ; on the peritoneal surface there was a minute hard tubercle.

Cæcum, Colon.—Normal.

Mesenteric Glands.—At the anterior end of the mesentery there were four glands ranging in size from a marble to a pigeon's egg. These on section showed in the cortex irregular firm tuberculous nodules of various sizes, and numerous caseous foci studding a greyish translucent tissue ; the nodules consisted of rather opaque pinkish grey white tissue in which numerous minute opaque yellow points were seen.

Near the posterior end of the mesentery there were two enlarged glands which showed in the cortex nodules, similar to the above, in a state of early caseation ; at the termination of the mesentery there was a small gland with a caseating nodule in the cortex half an inch long ; these three glands also showed numerous caseous foci.

Other mesenteric glands were normal.

Ileo-Colic Glands.—One gland was indurated and much enlarged, measuring 2 in. by 1¼ in. by ¾ in. ; on section the greater part of the cortex was studded with opaque foci of caseation and at one part showed a firm caseated mass similar to those in the mesenteric glands ; the gland was very œdematous.

Other glands in this region were normal.

Colic Glands.—Normal.

The lymphatic glands in and around the pancreas were normal ; also the cœliac glands.

Spleen.—11 ozs. Normal.

Liver.—In the substance beneath the capsule there was a minute yellow point ; otherwise the liver was perfectly normal.

Portal Glands.—The cortex of one of the portal glands contained two caseous tubercles.

Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart and Pericardium.—Normal.

Lungs.—Parenchyma spotted with petechial hæmorrhages. In the left lung, just under the pleura, there were two or three little dark grey translucent points (early tubercles ?) ; in the right lung one similar point was seen.

Thoracic Glands.—The bronchial and mediastinal glands were slightly enlarged, and on section very congested and œdematous ; no tubercles were seen.

Pleura.—Normal.

Lumbar Glands, Iliac Glands, Precrural Glands, Popliteal Glands, Gluteal Glands, Ischiatic Glands, Prescapular Glands, Prepectoral Glands, Axillary Glands were free from any sign of tuberculosis.

At the seat of inoculation of tuberculin there was a very large tuberculin swelling ; the subcutaneous and muscular tissues were very œdematous, the œdema extending into the dewlap.

Left Prescapular Gland.—2 in. by 1 in. by ¾ in., on section œdematous.

Right Prescapular Gland.—1¾ in. by ⅝ in. by ½ in.

Microscopical Examination.

Smears from : —

Mesenteric Gland.—Tubercle bacilli fairly numerous.

Intestine.—Tubercle bacilli scanty.

Lung, Liver.—No tubercle bacilli.

Portal Gland.—Two (?) tubercle bacilli.

Number of Guinea-pig.	Weight in grammes.	Material Injected.	Duration of Life.	Result.
1217	310	E. of Spleen.	Killed 105 days.	Healthy.
1218	330	E. of Mediastinal Gland.	Killed 105 days.	Healthy.
1219	450	E. of Mesenteric Gland.	Died 24 days.	General Tuberculosis.
1220	330	Peritoneal Fluid.	Killed 105 days.	Healthy.

CALF 186.

Fed—Once with tuberculous milk of Cow 164.

Date—July 26th, 1904.

Amount of Milk—282 cc.

Number of tubercle bacilli—10,000,000.

Weight—August 2nd, 1904, 2 cwt. 2 qrs. 17 lbs. [Age—7 months.]

Killed—September 7th. 43 days after experiment began.

Clinical History.

The calf remained in apparently good health during the experiment.

Temperature.

Irregular, chart showed a series of small rises; the highest point reached was 39·7° C.

Weights.

	cwts.	qrs.	lbs.
August 2nd, 1904- - - -	2	2	17
September 7th, 1904 - - -	2	3	7

Gain in weight.—18 lbs.

Average weekly increase.—3·5 lbs.

Tuberculin Test.

September 5th, 1904. 41 days after the experiment began. Positive, rise of temperature 1° C. Good local reaction.

POST-MORTEM EXAMINATION.

Condition.—Good.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Parotid Lymphatic Glands, Cervical Glands.—Normal.

Abdomen :

The peritoneal cavity contained a slight excess of clear fluid.

On the peritoneum covering the floor of the abdomen there were about a dozen hard pearly tubercles, each the size of a pin's head.

Omentum.—Normal.

Small Intestines.—Two feet from the pylorus the mucous membrane of the small intestine showed a slightly raised area, 5 mm. across; in the centre there was a small ulcer, the base of which was thickened and studded with opaque white foci. In the early part of the ileum a Peyer's patch contained a flattened caseous nodule 6 mm. in diameter; in the centre there was a small ulcer, through which projected softened caseous material; the lymphoid tissue surrounding the nodule showed a number of small caseous tubercles; on the serous surface opposite the nodule there was a translucent pearly tubercle, slightly opaque in the centre.

A few feet further along the mucous membrane showed a congested hemispherical caseous nodule, in the centre of which there was a minute ulcer.

A similar nodule was seen in the first part of the long Peyer's patch; near the termination of this patch there was a small ulcer with a caseous base.

Large Intestine.—In the mucous membrane of the colon, near the ileo-cœcal valve, there were two ulcers about 5 mm. in diameter; in the cæcum there was a similar but slightly larger ulcer. The bases of these ulcers were a little thickened, but showed no sign of caseation.

Mesenteric Glands.—A few inches from the pylorus in the mesentery of the duodenum there was a gland the size of a broad bean, which on section showed firm grey translucent tissue studded with caseous foci; the cut surface of the gland showed numerous hæmorrhagic points.

Near the anterior end of the mesentery there was an enlarged gland measuring 1½ in. by ¾ in. by ½ in.; on section more than three-quarters of the gland substance was seen to be in a state of early caseation.

At the junction of the middle and posterior thirds of the mesentery there were two enlarged glands; one contained a congested caseating nodule 1 cm. in diameter; the other showed in the cortex large caseating masses affecting about half the substance, and scattered caseous tubercles.

Near the termination of the mesentery another gland showed two caseating masses, each about 2 by 2 by 1 cm., and in a terminal gland there was one similar mass. Both the latter glands also contained scattered caseous tubercles.

The caseated areas were not softened or perceptibly calcareous, but showed minute yellow opaque points, which may have been foci of beginning calcification.

Ileo-Colic Glands.—One in the angle between the ileum and cæcum was much enlarged and showed on section about half the cortex caseous; in the other half of the gland there were discrete tubercles.

Lying on the colon, near the termination of the ileum, there were three glands, the largest the size of a small walnut; the latter gland showed throughout the greater part of the cortex firm pinkish grey tissue mottled with little hæmorrhagic points; in the more normal parts of the gland there were scattered caseous tubercles. Of the remaining two glands one was normal, the other contained a caseating nodule 1 cm. in diameter.

Colic Glands.—One mid-colic gland was enlarged to the size of a thrush's egg and hardened; on section half the cortex was in a state of early caseation, the rest showing scattered miliary tubercles.

Other colic glands were normal.

Cœliac Lymphatic Glands, Portal Lymphatic Glands, Pancreatic Lymphatic Glands.—Normal.

Spleen.—Fifteen ounces. Normal.

Liver.—Just beneath the capsule, on the posterior surface, there were three minute pearly white points; on the anterior surface there was a greyish white translucent tubercle the size of a No. 4 shot (inoculated into a guinea-pig), and here and there minute yellow specks. No tubercles were seen in the depth of the liver substance.

Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—Perfectly normal throughout.

Mediastinal Glands.—A mediastinal gland above the bifurcation of the trachea showed in the cortex three small caseous tubercles.

Other mediastinal glands and the bronchial glands were normal.

Pleura, Diaphragm.—Normal.

Lumbar Glands, Iliac Glands, Pudic Glands, Precrural Glands, Popliteal Glands, Gluteal Glands, Ischiatic Glands, Prescapular Glands, Prepectoral Glands and the Axillary Glands were free from any sign of tuberculosis.

At the seat of inoculation of tuberculin, on the left side of the neck, there was a prominent œdematous tumour 7 in. by 3 in.

Left Prescapular Gland.—Measured $2\frac{1}{2}$ in. by $1\frac{1}{3}$ in. by $\frac{2}{3}$ in. and on section was very œdematous, with cortical hæmorrhages.

Right Prescapular Gland.—Measured 2 in. by 1 in. by $\frac{1}{2}$ in. and on section was slightly œdematous.

Microscopical Examination.

Smears from :—

Intestine.—No tubercle bacilli.

Ileo-Colic Gland.—Numerous tubercle bacilli.

Mediastinal Gland.—One (?) tubercle bacillus.

Liver.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in grammes.	Material Injected.	Duration of Life.	Result.
1213	320	E. of Spleen.	Killed 105 days.	Spontaneous Tuberculosis.
1214	350	E. of Liver.	Killed 105 days.	General Tuberculosis.
1215	320	E. of Bronchial Gland.	Killed 105 days.	Healthy.
1216	300	E. of Ileo-Colic Gland.	Died 28 days.	General Tuberculosis.

CALF 200.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Weight—July 19th, 1904, 0 cwts. 3 qrs. 26 lbs. [Age—7 weeks.]

Killed—November 18th, 1904. 127 days after the experiment began.

Clinical History.

The calf remained in good health during the experiment.

Temperature.

The temperature began to rise on the sixth day; on the seventh it had reached 41·7° C., and on the eighth was 41·6° C.; then it gradually fell and on the thirteenth day was normal. Subsequently, with the exception of a sharp rise on the nineteenth day to 39·9° C., and a further one on the sixty-first to 39·8° C., the temperature remained normal throughout.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - -	0	3	26
November 18th, 1904 - - - -	2	0	0

Gain in weight.—1 cwt. 0 qrs. 2 lbs.

Average weekly increase.—6·3 lbs.

Tuberculin Test.

November 15th. 124 days after the experiment began. Positive, rise of temperature 1·5° C. Ill-defined local swelling; no constitutional disturbance.

POST-MORTEM EXAMINATION.

Condition.—Very good.

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Parotid Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

There was a slight excess of serous fluid in the peritoneal cavity.

Small Intestine, Large Intestine.—Normal throughout.

Mesenteric Glands.—The mesenteric glands were all normal in size; one about the middle of the mesentery showed in the cortex a translucent nodule 3 mm. in diameter, containing yellow slightly gritty central foci. All the other mesenteric glands were divided into thin transverse sections and found to be perfectly normal in appearance.

Ileo-Colic Glands, Colic Glands, Gastric Glands, Pancreatic Glands, Cœliac Glands, Portal Glands.—Normal.

Liver.—Normal on the surface and on section.

Spleen (10 ozs.), *Kidneys.*—Normal on the surface and on section.

Suprarenal Bodies, Gall Bladder.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the substance of the right cephalic lobe, just under the pleura, there was a firm nodule 1 cm. in diameter ; this on section was composed of firm greyish translucent tissue, with a minute central cavity containing soft purulent material.

There was a similar but smaller nodule in the left caudal lobe. Both nodules were surrounded by irregular dark red zones of consolidation ; they were probably of a parasitic nature.

No tubercle nodules were seen.

The parenchyma of the lungs was mottled with ecchymoses and petechial hæmorrhages.

Bronchial Glands, Mediastinal Glands.—Were normal in size, but had deeply congested medullæ.

The mediastinal gland situated above the bifurcation of the trachea contained in the cortex a nodule about 5 mm. in diameter ; this nodule was opaque yellow and slightly gritty in the centre, translucent around the margins.

The other mediastinal and the bronchial glands were free from tubercles.

Various Lymphatic Glands :

Ischiatic, Gluteal, Popliteal, Precrural, Pudic, Iliac, Ilio-Sacral, Lumbar, Axillary, Prepectoral.—Normal.

Left Prescapular.—Was more than twice the size of the right and on section was œdematous.

Both prescapular glands were free from tubercles.

The subcutaneous tisues at the seat of inoculation of tuberculin, on the left side of the neck, were moderately thickened and œdematous.

Testicles.—Normal.

Microscopical Examination.

Lung Nodule (large).—No tubercle bacilli

Mesenteric Gland Nodule.—One beaded tubercle bacillus.

Mediastinal Gland Nodule.—One tubercle bacillus (?).

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1354	350	E. of Bronchial Gland Nodule.	Died 47 days.	General Tuberculosis.
1355	190	E. of Mesenteric Gland Nodule.	Died 44 days.	General Tuberculosis.
1356	270	E. of Lung Nodule (Small).	Killed 145 days.	Healthy.

CALF 190.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Weight—July 19th, 1904, 2 cwts. 1 qr. 16 lbs. [Age—7 months.]

Killed—November 17th, 1904. 126 days after the experiment began.

Clinical History.

There were no signs of illness during the experiment.

Temperature.

The temperature was slightly raised during the seventh week (maximum 39.8°C.), and was a little irregular, but lower, during the eighth ; in the tenth week there was a further period of febrile temperature for six days (maximum 39.6°C.). Subsequently it was normal.

Weights.

The weight steadily increased week by week.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - -	2	1	16
November 17th, 1904 - - -	3	1	20

Gain in weight.—1 cwt. 0 qr. 4 lbs.

Average weekly increase.—6.4 lbs.

Tuberculin Test.

November 15th. 124 days after the experiment began. Positive, rise of temperature, 1.5°C. Ill defined local swelling. No general disturbance.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen :

There was a slight excess of serous fluid in the peritoneal cavity.

Omentum, Peritoneum.—Normal.

Small Intestine.—At the anterior end of the long Peyer's patch in the ileum there was beneath the mucous membrane a firm nodule the size of a small pea ; it projected above the surface and on section was grey translucent and homogeneous throughout. With this exception the small intestine was normal.

Large Intestine.—Normal.

Mesenteric Glands.—At the junction of the middle and posterior thirds of the mesentery a mesenteric gland presented a nodular enlargement, 1½ in. by 1 in. by ⅔ in. ; this on section showed in the centre a lenticular mass, half an inch in long diameter, of dense opaque greyish white caseated tissue surrounded by a broad zone of firm translucent tissue studded with pinhead-sized yellow calcareous tubercles; in another part of the cortex of this gland there was a small caseo-calcareous nodule.

The other mesenteric glands were normal in size and general appearance.

Gastric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Spleen.—13 ozs. Normal.

Liver.—In the thin portions of the left lobe there were some thickened bile ducts. Otherwise normal.

Gall Bladder, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart.—Beneath the endocardium of the right ventricle there was a spherical fibroid nodule, 3 millimetres in diameter, with a canary yellow central focus.

Pericardium, Pleuræ.—Normal.

Lungs.—Normal in colour and texture. The substance was spotted with petechial points of hæmorrhage; there was no sign of tubercle.

Mediastinal Glands.—Dorsal and ventral mediastinal glands normal.

Bronchial Glands.—Left bronchial gland, not enlarged, showed in the cortex two pea-sized nodules; these were translucent and contained yellow foci, slightly gritty from calcification.

Right Bronchial Gland.—Normal.

Tracheal Glands.—Normal.

Various Lymphatic Glands :

Ischiatic, Gluteal, Poplitcal, Precrural, Pudic, Iliac, Ilio-Sacral, Lumbar, Axillary, Prepectoral.—Normal.

At the seat of inoculation of tuberculin, on the left side of the neck, the subcutaneous tissues were slightly thickened and œdematous.

The Left Prescapular Gland was twice the size of the right; on section it was œdematous and showed petechial hæmorrhages in the cortex.

Both prescapular glands were free from tubercles.

Testicles.—Normal.

Microscopical Examination.

Mesenteric Gland Emulsion.—Moderately numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1352	220	E. of Bronchial Gland Nodule.	Died 65 days	General Tuberculosis.
1353	220	E. of Mesenteric Gland.	Died 52 days	General Tuberculosis.

CALF 192.

Fed—Once with an emulsion made from the organs of Guinea-pigs 1148 and 1150 inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc. (mixed with sterile milk).

Number of tubercle bacilli—10,150,000.

Weight—August 30th, 1904. 1 cwt. 0 qrs. 0 lbs. [Age—12½ weeks.]

Killed—January 4th, 1905. 133 days after experiment began.

Clinical History.

At the time of feeding the calf was noticed to have diarrhœa. During the week following the animal became very seedy, with rough coat, dry nose and increased diarrhœa; this condition continued for several weeks; the appetite was very poor, and there was obvious loss of flesh; at one time it was thought that the animal was going to die; after about six weeks, however, its condition showed improvement, and in a short time it got perfectly well again.

Temperature.

The temperature was raised during the first two months, but only on one occasion rose above 39·7°C.; during the latter part of the experiment the temperature was normal.

Weights.

In the first month there was a gain in weight of 7 lbs. On October 11th (6 weeks after feeding) the weight of the animal was the same as at the beginning of the experiment; subsequently there was a steady increase in weight.

	cwt.	qrs.	lbs.
August 30th, 1904 - - -	1	0	0
January 4th, 1905 - - -	1	2	24

Gain in weight.—2 qrs. 24 lbs.

Average weekly increase.—4·4 lbs.

Tuberculin Test.

December 16th, 1904. 114 days after the experiment began. Doubtful.—Rise of temperature 0·6°C.

POST-MORTEM EXAMINATION.

Carcase.—In good condition.

Tongue, Pharynx, Tonsils, Pharyngeal Lymphatic Glands, Submaxillary Lymphatic Glands, Parotid Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen :

Omentum.—Normal.

Peritoneum.—On the floor of the abdomen, on the left side, there were three pearly white foci, the size of mustard seeds.

Small Intestine, Large Intestine.—Normal.

Gastric Glands, Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal in size and appearance.

Spleen.—Weighed 9 ozs. Capsule very wrinkled and thickened; pulp dark red and firm; no tubercles seen.

Liver.—Scattered throughout the substance were numerous minute yellow foci (fatty ?).

Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura, Larynx, Trachea.—Normal.

Lungs.—With the exception of some carnified lobules in the anterior lobes the lungs were perfectly normal.

Mediastinal Glands, Bronchial Glands.—Normal.

Coeliac Glands, Lumbar Glands, Iliac Glands, Precrural Glands, Popliteal Glands, Gluteal Glands, Ischiatic Glands, Prescapular Glands, Prepectoral Glands, Axillary Glands.—Normal.

A Guinea Pig No. 1407 inoculated intraperitoneally with an emulsion made from the liver, and killed in 98 days, showed numerous tubercles in the lungs, extensive caseation of the bronchial glands, discrete tubercles in the spleen, a few necrotic patches in the liver, caseation of the portal and cœliac glands and no tuberculosis of the omentum or peritoneum. The distribution of the disease in the animal was unusual and suggested that the tuberculosis had been set up by bacilli which had been inhaled.

CALF 182.

Fed—Once with an emulsion made from the organs of Guinea-pigs, 1148 and 1150 inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc. (mixed with sterile milk).

Number of tubercle bacilli—10,150,000.

Weight—August 30th, 2 cwts. 3 qrs. 1 lb. [Age—7 months.]

Killed—January 5th, 1905. 135 days after experiment began.

Clinical History.

The calf remained well during the experiment.

Temperature.

With the exception of two or three slight rises in the latter part of the experiment (maximum 39·5° C.), remained normal throughout.

Weights.

In the first fortnight the animal gained 27 lbs.; then for a fortnight the weight was stationary; subsequently there was a steady increase in weight.

	cwt.	qrs.	lbs.
August 30th, 1904 - - -	2	3	1
January 5th, 1905 - - -	3	3	21

Gain in weight.—1 cwt. 20 lbs.

Average weekly increase.—7·3 lbs.

Tuberculin Test.

December 16th, 115 days after the experiment began. Positive, rise of temperature 1·6°C.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Tongue, Tonsils, Pharyngeal Mucous Membrane, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Parotid Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Intestines.—About the middle of the small intestine a Peyer's patch showed eight eminences. One was considerably raised above the surface and measured 1·5 by 1 cm.; in the centre there was a puckered ulcer, and on section a few minute calcareous grains. The other seven were only slightly raised above the surface and showed minute central depressions; on section they showed in their centres firm translucent tissue containing here and there opaque foci. On the peritoneal surface of this patch there were three or four minute transparent tubercles. Between this patch and the terminal patch two Peyer's patches each showed a firm translucent nodule, the size of a split pea, over which the mucous membrane was intact; in the centre of one of these nodules there was a minute yellow point. Under the mucous membrane, remote from any lymphoid patch, there was a pea-sized nodule, grey and homogeneous throughout.

In the long Peyer's patch there were four star-shaped ulcers, situated in the centre of flattened eminences, which ranged in size from 5 to 10 mm. in diameter; section showed in each a softened caseous focus underneath the ulcer. This patch showed besides two small grey homogeneous nodules, over which the mucous membrane was intact.

Large intestine normal.

Mesenteric Glands.—The glands in the anterior part of the mesentery were normal. In the middle of the mesentery there was a greatly enlarged and hardened gland measuring 2 in. by 1½ in. by 1 in., which on section showed a large dense caseous mass, gritty around the margins, surrounded by translucent fibroid tissue closely beset with yellow calcareous foci; the capsule of the gland was thickened. On the opposite side of the mesentery a gland contained a calcareous nodule, the size of a bean.

At the termination of the mesentery there were two enlarged glands, one the size of a small hen's egg, the other a little smaller, which on section closely resembled the gland first described.

The glands in the intermediate part of the mesentery contained three calcareo-caseous nodules, the largest 1¼ in. by 1¼ in. by ⅔ in., the smallest the size of a marble; there were also a small group of calcareous tubercles and a single isolated tubercle.

Ileo-Colic Glands, Colic Glands, Pancreatic Glands, Cœliac Glands.—Normal.

Spleen.—15 ozs. Normal.

Liver.—In the depth of the liver substance there was a translucent grey nodule, 2 millimetres in diameter, with a calcareous grain in the centre.

Portal Glands.—One showed in the cortex a calcified tubercle the size of a millet seed; the rest were normal.

Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura, Lungs, Mediastinal Glands, Bronchial Glands.—Normal.

Renal Glands, Lumbar Glands, Iliac Glands, Precrural Glands, Popliteal Glands, Gluteal Glands, Ischiatic Glands, Pudic Glands, Prescapular Glands, Prepectoral Glands, Axillary Glands, Mammary Gland.—Normal.

Microscopical Examination.

Intestine (Smear from one of the ulcerated nodules in the long Peyer's patch).—Three tubercle bacilli.

Mesenteric Gland Emulsion.—Numerous tubercle bacilli.

Liver *Portal Gland*	} No tubercle bacilli.

A Guinea-pig, inoculated intraperitoneally with an emulsion made from a tuberculous mesenteric gland, died in 44 days of general tuberculosis.

GOAT 16.

Age—10½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—August 29th, 1904.

Duration of Experiment—44 days.

Clinical History.

The animal showed no signs of illness during experiment.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - -	0	0	27
August 29th, 1904 - - - - -	0	0	33

Gain in Weight.—6 lbs.

Average weekly increase.—1 lb.

Temperature.

The temperature rose to 40°C. two days before the tuberculin test; previously it had varied between 38·5 and 39.4°C.

Tuberculin Test.

August 24th, 1904. 41 days after the experiment began. Rise of temperature 0.3°C. Temperature high before the test. Slight local œdema.

POST-MORTEM EXAMINATIONS.

Condition.—Poor.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

There was no œdema at the seat of inoculation of tuberculin, but the prescapular gland on this side was slightly larger than the one on the opposite side, and on section was œdematous and congested.

Abdomen :

Omentum, Peritoneum.—Normal.

Intestines.—The mucous membrane of the small intestine throughout its whole length showed numerous milky white patches, the largest about 5 mm. in diameter. These patches were slightly raised above the surface and penetrated the epithelial layer; they were soft and could be readily scraped away with the point of a knife. They were very numerous in the duodenum, less so in the jejunum, and were only seen here and there in the ileum.

A smear showed large oval spores which resisted decolourising after staining with carbol fuchsin.

The intestines showed no sign of tuberculosis.

Mesenteric Glands.—A gland in the anterior part of the mesentery showed in the cortex a small area of induration studded with early caseous foci. (Tubercle bacilli found.)

Other mesenteric glands were normal.

Spleen, Liver, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the right caudal lobe, just beneath the pleura, there was a dark grey translucent tubercle the size of a pin's head, resembling those seen in the lung of Goat 12. (A smear showed no tubercle bacilli.) Lungs otherwise normal.

Thoracic Glands.—Normal.

All superficial lymphatic glands free from tuberculosis.

Microscopical Examination.

Smears from :—

Mesenteric Gland.—Numerous tubercle bacilli.

Lung.—No tubercle bacilli.

Guinea-Pigs Inoculated.

A guinea-pig inoculated with an emulsion made from the spleen remained healthy after a period of 61 days.

GOAT 12.

Age—1 year 10½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—August 29th, 1904.

Duration of Experiment—44 days.

Clinical History.

The animal remained in good health throughout the experiment.

Weights.

	qrs.	lbs.
July 19th, 1904 - - - - - -	2	7
August 29th, 1904 - - - - - -	2	18

Gain in weight.—11 lbs.

Average weekly increase.—1·83 lbs.

Temperature.

The temperature remained practically normal throughout.

Tuberculin Test.

August 24th, 1904.—39 days after the experiment began. Rise of temperature 0.4°C. Very slight local thickening.

POST-MORTEM EXAMINATION.

Condition.—Good.

Tongue, Pharynx, Larynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

There was no œdema at the site of inoculation, but the neighbouring prescapular gland was slightly larger than normal and somewhat œdematous.

Omentum, Peritoneum, Intestines, Abdominal Lymphatic Glands, Spleen, Kidneys, Suprarenal Bodies.—Were all perfectly healthy.

Liver.—Near the margin of the liver there was a hard spherical yellow body, the size of a pin's head, dry and gritty when crushed between glass plates; no tubercle bacilli were found in a smear (biliary concretion ?).

Lungs.—In the posterior parts of the caudal lobes, seen beneath the pleura as well as in the substance, there were numerous minute dark grey translucent foci, resembling early tubercles; at the extreme margins one or two larger semi-translucent nodules were seen; these showed no sign of central necrosis.

No parasites were found in the bronchi.

Thoracic Lymphatic Glands, Heart, Pleura, Superficial Lymphatic Glands.—Normal.

Microscopical Examination.

Smears from:—

Liver } No tubercle bacilli.
Lung }

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1204	390	E. of Spleen	Killed 95 days	Healthy.
1205	470	E. of Lung	Killed 95 days	Healthy.
1206	500	E. of Mesenteric Gland	Killed 95 days	Healthy.

GOAT 18.

Age—11 weeks.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs, 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million (mixed with sterilised milk and given with a pipette).

Killed—October 7th, 1904.

Duration of Experiment—45 days.

Clinical History.

Animal remained in good health throughout the experiment.

Weights.

	qrs.	lbs.
August 30th, 1904 - - - - - -	1	18
October 7th, 1904 - - - - - -	1	13

Loss of weight.—5 lbs.

Temperature.

Somewhat irregular: highest point reached 39·5°C. on the thirty-second day.

Tuberculin Test.

October 4th, 1904. 43 days after the experiment began. Rise of temperature 1·5°C. Ill-defined local swelling. No general disturbance.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen:

Omentum, Peritoneum.—Normal.

Small Intestines.—The mucous membrane of the duodenum showed numerous little milky white patches; these were easily scraped away with a knife and appeared to be confined to the epithelial layer (a smear preparation was made, but none of the large spores seen in similar patches in other goats' intestines could be found); one or two similar patches were seen in various parts of the ileum.

There was no ulceration or sign of tuberculosis.

Large Intestine, Ileo-Colic Glands, Colic Glands.—Normal.

In the loose tissues between the stomach and the left pillar of the diaphragm there was a slightly enlarged gland (gastric ?), which on section showed in the cortex an oval nodule, 8 mm., in long diameter; the central part of the nodule was composed of pinkish-yellow tissue containing minute opaque yellow points, the marginal of translucent grey tissue.

Liver, Portal Glands, Spleen.—Normal.

Kidneys.—The left showed in the cortex three or four minute pale whitish specks (smear preparations showed no tubercle bacilli). The right was normal.

Suprarenal Bodies, Lumbar Glands, Iliac Glands, Precrural Glands.—Normal.

Thorax:

Lungs, Bronchial Glands, Mediastinal Glands.—Normal.

Heart, Pleura.—Normal.

The tissues at the seat of inoculation of tuberculin on the right side of the neck were infiltrated with œdema fluid.

Right Prescapular Gland.—Was about twice the size of the left and on section was very œdematous, showing minute hæmorrhagic points in the cortex.

Left Prescapular Gland, Prepectoral Glands.—Normal

Microscopical Examination.

A smear from the tuberculous gland showed numerous tubercle bacilli, short, straight, and well stained.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1304	290	E. of Spleen	Killed 76 days	Spontaneous Tuberculosis.
1305	340	E. of Gastric Gland	Died 28 days	General Tuberculosis.

GOAT 26.

Age—Adult.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million (mixed with sterilised milk and given with a pipette).

Killed—October 7th, 1904.

Duration of Experiment—45 days.

Clinical History.

There were no signs of illness during the experiment.

Weight.

	qrs.	lbs.
August 30th, 1904 - - - - -	3	7
October 4th, 1904 - - - - -	3	12

Gain in weight.—5 lbs.

Average weekly increase.—83 lbs.

Temperature.

The temperature remained practically normal throughout. Highest point 39·3° C.

Tuberculin Test.

October 4th, 1904. 42 days after the experiment began. Rise of temperature 1·6° C. Ill-defined tender, hot, œdematous local swelling. Prescapular gland, enlarged and tender. No constitutional disturbance.

POST-MORTEM EXAMINATION.

Condition.—Good.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestines.—The mucous membrane showed at intervals throughout the whole length small milky white patches, and also numerous little rounded elevations the size of a pin's head ; the latter were felt as hard bodies on passing the finger over the surface ; superficially they had a whitish appearance ; a smear made from one of them showed several large oval spores, which resisted decolorisation after staining with carbol fuchsin.

With the exception of the above, the intestines were normal.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

A gland situated in the loose tissues between the stomach and the left pillar of the diaphragm (? gastric), the size of a large pea, showed on section firm grey translucent tissue penetrated with a greyish yellow network.

Liver, Portal Glands, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Lumbar Glands, Iliac Glands, Precrural Glands.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the left posterior lobe, just under the pleura, there were two firm translucent nodules about 2 mm. in diameter ; on section they were homogeneous throughout.

(One of these nodules was crushed and stained with carbol fuchsin ; microscopically numerous small worm-like embryos were seen, but no tubercle bacilli.)

The rest of the lung was normal.

Bronchial Glands, Mediastinal Glands.—Normal.

The tissues at the seat of inoculation of tuberculin, on the right side of the neck, were œdematous and congested ; the prescapular gland on the same side was much enlarged œdematous and hæmorrhagic in the cortex.

Right Prescapular Gland, Right Prepectoral Gland.—Normal.

Microscopical Examination.

A smear from the gastric gland showed numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea Pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1306	250	E. of Lung	Killed 76 days	Healthy.
1307	190	E. of Spleen	Killed 76 days	Healthy.
1308	250	E. of Cœliac Gland	Died 30 days	General Tuberculosis.

GOAT 14.

Age—10½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 23rd, 1904.

Duration of Experiment—130 days.

Clinical History.

The animal remained in apparent good health during the experiment.

Weights.

In the first week there was a gain of 7 lbs.; then for four weeks the weight was practically stationary; on August 30th there was a fall to the original weight (about this time the temperature rose); subsequently there was a steady increase in weight.

	qrs.	lbs
July 19th, 1904 - - - - - - -	1	0
November 23rd, 1904 - - - - -	1	15

Gain in weight.—15 lbs.

Average weekly increase.—·83 lbs.

Temperature.

Rose on the 43rd day (August 29th) and was high for 3 days, maximum 40·7°C.; during the remainder of the experiment it was practically normal.

Tuberculin Test.

November 15th, 1904. 119 days after the experiment began. Positive. Rise of temperature 1·1°C. Ill-defined tender local swelling. No general disturbance.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Pharyngeal Lymphatic Glands, Cervical Lymphatic Glands, Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestine, Large Intestine.—Normal throughout.

Gastric Glands.—One contained a yellow gritty tubercle, the size of a pin's head; the rest were normal.

Mesenteric Glands.—A gland situated about the middle of the mesentery showed a localised enlargement three quarters of an inch in diameter; on section the cortex of the gland at this part was entirely replaced by pinkish yellow caseous masses, which here and there were beginning to soften at the margins; the cut surfaces of the masses showed scattered opaque yellow streaks and foci, which were just perceptibly gritty.

Other mesenteric glands were normal.

Ileo-Colic Glands, Colic Glands.—Normal.

Liver.—Embedded in the substance of the liver, just beneath the capsule, there was a tubercle, the size of a wheat grain; this had a pearly white capsule and a softened caseous centre. In the depth of the liver substance there was a soft caseous tubercle the size of a No. 4 shot.

Portal Glands.—One portal gland contained a yellow highly calcareous tubercle, the size of a pin's head. Three others were normal.

Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—The left lung contained nine or ten tubercles, ranging in size from a pin's head to a millet seed: these had translucent margins and yellow very gritty centres; they were situated chiefly on the surface, just under the pleura.

In the right lung there were similar tubercles, but not so numerous.

Bronchial Glands.—Normal.

Mediastinal Glands.—The long caudal mediastinal gland, not enlarged, contained a yellow calcified tubercle, the size of a mustard seed.

Testicles.—Normal.

Pudic Glands, Popliteal Glands, Precrural Glands, Iliac Glands, Lumbar Glands, Axillary Glands, Prescapular Glands, Prepectoral Glands.—Normal.

Microscopical Examination.

Smears from :—

Mesenteric Gland.—Fairly numerous tubercle bacilli.

Portal Gland.—Three tubercle bacilli.

Gastric Gland.—No tubercle bacilli.

Mediastinal Gland.—No tubercle bacilli.

Liver.—No tubercle bacilli.

Lung.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in grammes.	Material Injected.	Duration of Life.	Result.
1,362	290	E. of Mesenteric Gland	Died 77 days	General Tuberculosis.
1,363	400	E. of Lung	Died 56 days	General Tuberculosis.

GOAT 22

Age—Adult.

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 22nd, 1904.

Duration of Experiment—129 days.

Clinical History.

There were no signs of ill-health during the experiment

Weights.

	qrs.	lbs.
July 19th, 1904 - - - - -	2	20
August 30th, 1904 - - - - -	3	4
September 13th, 1904 - - - -	2	26
November 22nd, 1904 - - - -	3	7

Gain on initial weight.—15 lbs.

Temperature.

There was a sharp rise to 40·6°C. on the third day; with this exception the temperature was normal throughout.

Tuberculin Test.

November 15th, 1904, 122 days after the experiment began. Rise of temperature 1·8°C. (Max. 40·8°. 21 hours after injection). Ill-defined tender local swelling; no constitutional disturbance.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Left Retropharyngeal Gland.—Contained in the cortex a caseous nodule, 6 mm. in diameter, surrounded by a translucent fibroid capsule. On section the caseous mass was opaque yellow and slightly gritty in the centre, yellowish white and somewhat translucent around the margins. It could be easily shelled out from the gland substance, but was not softened.

Right Retropharyngeal Gland, Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestine.—Beneath the mucous membrane of the small intestine there was a number of hard translucent bodies, the size of mustard seeds; some of these were seen to have a minute dark spot in the centre. There was no sign of ulceration.

Large Intestine, Gastric Glands, Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Spleen.—Normal on the surface and on section.

Liver.—In the substance of the left lobe, just under the capsule, there were two irregular nodules 2 and 3 mm. in diameter respectively; they consisted of fibrous tissue and showed in the centre soft yellow foci. Besides these there were a few translucent spherical bodies, the size of mustard seeds. On the concave surface of the left lobe there were about a dozen similar bodies. Nothing abnormal was seen on section.

Gall Bladder, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

The Lungs contained numerous hard grey bodies ranging in size from a mustard seed to a millet seed. They occurred chiefly in the caudal lobes and were found in the depth of the lung as well as on the surface. In three places in the caudal lobes, near the dorsal surfaces, they were closely aggregated together, forming small semi-solid areas. One or two of the tubercles were slightly opaque in the centre; others showed minute dark points and so resembled the bodies seen beneath the mucous membrane of the small intestine.

No parasites were seen in the bronchi.

Mediastinal Glands.—The caudal mediastinal gland showed in the cortex three or four yellow softened tubercles, the size of pins' heads, appreciably gritty from calcification.

Bronchial Glands.—Left bronchial gland contained three similar foci. Right bronchial gland normal.

Uterus, Fallopian Tubes, Ovaries.—Normal.

Mammary Gland.—Gland tissue normal. Milk sinuses filled with turbid serous fluid.

Various Lymphatic Glands :

Supramammary, Precrural, Popliteal, Axillary, Prepectoral, Cervical.—Normal.

Prescapular Glands.—Both were a little larger than normal and on section congested (recent tuberculin test).

The subcutaneous tissues at the seat of inoculation of tuberculin were slightly thickened œdematous and congested.

Microscopical Examination.

Lung Tubercle.—No tubercle bacilli.

Left Bronchial Gland.—One tubercle bacillus.

Left Pharyngeal Gland.—Moderately numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1359	350	E. of Liver Nodule	Killed 77 days	General Tuberculosis.
1360	380	E. of Lung (semi-solid patch)	Killed 77 days	General Tuberculosis.
1366	420	E. of Caudal Mediastinal Gland (3 foci)	Killed 77 days	General Tuberculosis.

GOAT 20.

Age—About 2½ months.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150 inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million (the emulsion was mixed with sterilised milk and given with a pipette).

Killed—January 3rd, 1905.

Duration of Experiment—132 days.

Clinical History.

The animal became seedy about two months after feeding; she continued ill looking and in spite of the appetite being moderately good did not grow: during the last week she got much worse and would probably have died naturally in a week or two.

Weights.

	qrs.	lbs.
August 30th, 1904 - - - - -	0	21
November 8th, 1904 - - - - -	1	2
December 7th, 1904 - - - - -	1	4
January 3rd, 1905 - - - - -	0	27

Gain in weight during experiment.—6 lbs.

Temperature.

Became slightly irregular during the seventh to the eleventh weeks, showing occasional short rises (Max. 39·7° C); during the remainder of the experiment the temperature was almost continuously raised, but never rose higher than 39·9° C.

Tuberculin Test.

December 16th, 1904. 114 days after the experiment began. Positive. Rise of temperature 1·2° C.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Tongue, Pharynx.—Normal.

Tonsils.—Left tonsil was enlarged and indurated; the orifice was dilated and the mucous membrane lining the greater part of the interior was ulcerated; the ulcers were irregular, the floors being covered with whitish discharge: the substance of the tonsil was dense and fibroid and showed a few opaque whitish foci.

The right tonsil was in a similar condition, but not so enlarged.

Submaxillary Glands.—Right submaxillary gland contained a cheesy slightly gritty focus, 2 mm. in diameter.

The left was somewhat indurated at one extremity and showed when cut into some firm yellow streaks.

Parotid Glands.—The left parotid gland resembled the latter; the right parotid appeared normal.

Pharyngeal Glands.—On the left side there were two: one the size of a swallow's egg, the other that of a filbert; the small one on section consisted throughout of dense translucent fibroid tissue, showing at one extremity a delicate tracery of fine yellow lines: the large gland resembled the small one, but showed also an irregular cavity filled with caseo-pus.

On the right side there was a gland the size of a pigeon's egg, which on section was seen to be entirely converted into a cheesy caseous pulp; the caseous mass was surrounded by a thick fibrous wall, the internal surface of which was smooth. Attached to the capsule was a small indurated gland beset with opaque yellow foci and streaks.

Cervical Glands.—Right upper cervical contained a firm caseating nodule, 1 cm. in diameter.

Left upper cervical resembled the left submaxillary.

Two midcervical glands on the right side, the size of broad beans, were indurated and showed on section numerous yellow streaks in a firm translucent matrix; the left mid cervical glands were not affected.

Just in front of the anterior opening of the thorax, under the trachea, there was a large egg-shaped gland one and a half inches in length. On section it showed a congested caseating mass, gritty from calcification, occupying about half the substance.

Abdomen :

Omentum, Peritoneum.—Normal.

Stomach.—The mucous membrane along the lesser curvature, near the œsophageal opening, showed an oval ulcer 8 millimetres in greatest length, with raised slightly undermined edges and pale granular floor; the base was thickened and fibroid.

Small Intestine, Large Intestine.—Normal.

Gastric Glands.—Two in the lesser curvature, each about the size of a sparrow's egg, consisted practically throughout of dense opaque yellow caseated tissue slightly gritty from calcification; the capsules were thickened. Other small glands in the neighbourhood were normal.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Spleen.—Not enlarged, showed in the pulp a number of spherical translucent bodies, the size of pins' heads; they appeared to be simply slightly enlarged Malpighian bodies; they showed no sign of central necrosis (Tubercle bacilli found.)

Liver.—The substance was speckled with very minute grey foci.

Gall Bladder, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—Both lungs were crowded with nodules, ranging in size from 1 to 10 millimetres in diameter; they were seen on the surface as greyish slightly elevated areas, the larger of which were very irregular in outline. On section the small tubercles were opaque and yellow in the centre, translucent around the margins; the larger nodules were caseous and softened in the centre and had thick fibrous walls; the nodules were evenly distributed throughout the lungs and for the most part remained discrete; the lung tissue surrounding them was normally crêpitant.

Mediastinal Glands.—The caudal mediastinal gland was larger and firmer than normal, but showed on section only two or three small caseous foci.

Bronchial Glands.—These were slightly enlarged, but no opaque foci were seen.

Ventral mediastinal glands normal.

Prescapular Glands, Prepectoral Glands, Axillary Glands, Precrural Glands, Popliteal Glands, Mammary Gland.—Normal.

Microscopical Examination.

Right Tonsil
Right Submaxillary Gland
Mediastinal Gland
Gastric Gland
} Very numerous tubercle bacilli.

Spleen.—Moderately numerous tubercle bacilli.

GUINEA-PIG INOCULATED

INTRAPERITONEAL INOCULATION.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life	Result.
1404	150	E. of Gastric Gland	Died 12 days	Tuberculosis.
1405	—	E. of Spleen	Killed 15 days	Spontaneous Tuberculosis.
1406	—	E. of Liver	Died 36 days	General Tuberculosis.

GOAT 24.

Age—Nearly 2 years.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million (mixed with sterilised milk and given with a pipette).

Killed—January 4, 1905.

Duration of Experiment—133 days.

Clinical History.

The goat remained in good health during the experiment.

Weights.

	cwt.	qrs.	lbs.
August 30th, 1904	-	2	10
December 7th, 1904	-	3	7
January 4th, 1905	-	2	25

Gain in weight.—15 lbs.
Average weekly increase.—·83 lb.

Temperature.

With the exception of an occasional slight rise (highest 39·9°C.), normal throughout.

Tuberculin Test.

December 16th, 1904. 114 days after the experiment began.—Positive. Rise of temperature 1·9°C.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Pharynx, Larynx.—Normal.

Tonsils.—The right tonsil seemed a little larger than the left, but showed no sign of ulceration or caseation.

In the left tonsil there was a softened whitish focus.

Submaxillary Glands, Cervical Glands.—Normal.

Right Retro-Pharyngeal Gland, the size of a broad bean, was indurated and on section partly composed of cheesy caseated tissue, and partly of translucent glandular tissue studded with softened caseous foci, very gritty from calcification.

Left Retro-Pharyngeal Gland ,the size of a small pea, was normal.

Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach, Small Intestine, Large Intestine.—Normal.

Gastric Glands.—One in the lesser curvature was enlarged to the size of an almond and on section showed a softened gritty caseous nodule, 1 centimetre in diameter, and numerous discrete gritty calcareous tubercles.

The Mesenteric Glands were normal in size and appearance; one near the anterior end of the mesentery showed a minute pearly spherieal body which easily shelled out.

Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Under the capsule of the liver there was a small nodule with thin fibrous walls and brownish pultaceous contents; otherwise the liver was perfectly normal.

Portal Glands.—Normal.

Kidneys.—The left kidney showed on the surface a minute grey focus, which did not shell out. The right kidney showed three or four similar foci.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura, Larynx, Trachea.—Normal.

The Lungs showed under the pleura a few small nodules with greenish contents; in the dorsal part of the caudal lobes there were some semi-solid patches formed by closely aggregated grey foci; a few isolated grey foci were seen scattered about in various parts of the lung.

Bronchial Glands, Mediastinal Glands.—Normal.

Lumbar Glands, Iliac Glands, Precrural Glands, Popliteal Glands, Pudic Glands, Prescapular Glands, Axillary Glands, Uterus, Ovaries, Mammary Gland.—Normal.

Microscopical Examination.

Mesenteric Gland.—No tubercle bacilli.

Gastric Gland.—One tubercle bacillus.

Left Tonsil.—No tubercle bacilli.

Liver.—No tubercle bacilli.

Spleen (Malpighian Body).—No tubercle bacilli.

Left Kidney.—No tubercle bacilli.

Right Retro-Pharyngeal Gland.—No tubercle bacilli.

Lung (Contents of Small Nodule).—No tubercle bacilli.

PIG 68.

Age—9½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—0·136 cc.

Number of tubercle bacilli—10,000

Died—July 22nd, 1904. 8 days later.

POST-MORTEM EXAMINATION.

There was thickening and œdematous infiltration of the subcutaneous tissues on the left side, extending from the base of the left ear down the left fore-leg and to the posterior margin of the thorax.

There was some turbid fluid in the peritoneal cavity with flakes of purulent lymph on the visceral and parietal peritoneum.

The pericardial sac was filled with turbid fluid; the visceral and parietal pericardium was covered with a thick layer of fibrinous lymph which readily peeled off from the congested membrane.

There was no naked-eye evidence of tuberculosis in any of the organs or glands.

A streptococcus was isolated in pure culture from the fluid in the pericardium.

The animal was probably infected when tested with tuberculin on July 6th, 1904.

PIG 52.

Age—16 weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—0·136 cc.

Number of tubercle bacilli—10,000.

Died—August 9th, 1904. 26 days after the experiment began.

POST-MORTEM EXAMINATION.

There was no naked-eye evidence of tuberculosis in any of the organs or glands.

The mucous membrane of the large intestine was very congested and showed numerous superficial ulcers.

Cause of death: Ulcerative colitis.

PIG 82.

Age—7 to 8 weeks.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—·05 cc. of a 1 in 1,000 dilution.

Number of tubercle bacilli—10,000 (mixed with sterilised milk and given with ordinary food).

Killed—October 6th, 1904.

Duration of Experiment—43 days.

Clinical History.

The animal remained in good health throughout the experiment.

Weight.

	qr.	lbs.
August 30th, 1904 - - - -	1	3

Tuberculin Test.

October 4th. 1904. 41 days after the experiment began. Rise of temperature 0·8°C. No local œdema and no constitutional disturbance.

POST-MORTEM EXAMINATION.

Body.—In good condition.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Pharyngeal Lymphatic Glands, Cervical Lymphatic Glands, Thyroid.—Normal.

Abdomen:

The serous surfaces of the stomach and large intestine were roughened with small connective tissue growths.

Omentum, Parietal Peritoneum.—Normal.

Intestines.—The small intestines contained fifty-four round worms. One or two Peyer's patches were congested, but with these exceptions the intestines were normal.

Mesenteric Glands.—One mesenteric gland near the posterior end of the mesentery showed on section an area of congestion in the midst of which little points were seen, which were slightly more opaque than the surrounding gland tissue; the gland was not enlarged, and there was no induration. (Guinea-pig inoculated.) All other mesenteric glands were normal.

Liver, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax:

Lungs, Heart, Pericardium, and Pleura.—Normal.

Colic Glands, Coeliac Glands, Portal Glands, Pancreatic Glands, Lumbar Glands, Iliac Glands, Precrural Glands, Bronchial Glands, Inguinal Glands, Prescapular Glands, Prepectoral Glands.—Normal.

A cervical gland on the side of the inoculation of tuberculin was a little enlarged and œdematous.

A guinea-pig, inoculated with an emulsion made from the mesenteric gland, remained healthy after a period of 77 days.

PIG 58.

Age—6 to 7 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1905.

Amount of Milk—0·136 cc.

Number of tubercle bacilli—10,000.

Killed—August 26th, 1904.

Duration of Experiment—43 days.

Clinical History.

The pig remained in good health throughout the experiment.

Weights.

	cwt.	qrs.	lbs.
July 29th, 1904 - - - -	0	3	22
August 26th, 1904 - - - -	1	0	11

Gain in weight.—17 lbs.

Average weekly gain.—3·4 lbs.

Tuberculin Test.

August 24th. 41 days after the experiment began—Rise of temperature 0·2°C. No local swelling.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach, Intestines.—Normal.

Cœliac Glands, Portal Glands, Pancreatic Glands.—Normal.

Mesenteric Glands.—A mesenteric gland, situated about the middle of the mesentery, the size of a small pea, was indurated and on section was found to be in a state of early caseation.

A gland at the termination of the mesentery showed several yellow foci embedded in normal gland tissue. (Tubercle bacilli found.)

Ileo-Colic Glands, Colic Glands.—Normal.

Liver.—The liver showed in the substance beneath the capsule an opaque whitish body, 2 mm. in diameter ; deeper in the substance two similar bodies were seen ; none showed any sign of caseation.

Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the cephalic lobes several lobules were collapsed and airless ; the caudal lobes contained nodules similar to those described in Pig 64 ; along the posterior margins these occurred in little groups, but in other parts they were scattered singly here and there.

Bronchial Glands, Mediastinal Glands.—Normal.

Lumbar Glands, Iliac Glands, Precrural Glands, Inguinal Glands, Prescapular Glands, Prepectoral Glands.—Normal.

There was no appreciable œdema at the seat of inoculation of the tuberculin.

Microscopical Examination.

Smears from :—

Terminal Mesenteric Gland *Mid-Mesenteric Gland* -	Numerous tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-Pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1195	180	E. of Liver	Killed 117 days	Healthy.
1196	160	E. of Mesenteric Gland (normal to the eye)	Killed 117 days	Healthy.

PIG 70.

Age—9½ weeks.

Fed—Once with tuberculous milk from Cow 164.

Date—July 14th, 1904.

Amount of milk—1·36 cc.

Number of tubercle bacilli—100,000.

Killed—August 25th, 1904.

Duration of Experiment—42 days.

Weight.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - - -	0	0	21
August 25th, 1904 - - - - -	0	0	18

Loss of weight.—3 lbs.

Tuberculin Test.

August 24th. 41 days after the experiment began. Negative. Rise of temperature 0·3°C. No local reaction.

POST-MORTEM EXAMINATION.

Body.—Thin and in very poor condition.

Tongue, Pharynx and Tonsils.—Normal.

Submaxillary and Retro-Pharyngeal Glands.—Normal. A gland on the right side near the articulation of the jaw (? upper cervical) showed in the centre a focus of whitish pus, about 2 mm. across ; the gland was normal in size and was not indurated. No tubercle bacilli were found in a smear made from the pus.

The gland on the opposite side was normal.

Abdomen :

Omentum.—Normal.

Peritoneum.—The parietal peritoneum on the left side was roughened with short connective tissue processes and presented about half a dozen minute pearly bodies felt as hard granules on rubbing the finger over the surface.

Spleen and Liver.—Normal.

Portal, Cœliac and Pancreatic Glands.—Normal.

Stomach and Small Intestines.—Normal.

Large Intestine.—The mucous membrane of the large intestine was closely studded with rounded nodules, containing thick yellowish or greenish yellow material; this could be squeezed out through a minute central opening.

Mesenteric, Ileo-colic and Colic Glands.—Normal.

Kidney and Suprarenal Bodies.—Normal.

Thorax :

Heart and Pericardium.—Normal.

Lungs.—The right lung was adherent to the chest wall by numerous slender strands of connective tissue and the anterior lobes were closely adherent to the posterior.

The cephalic lobes of both lungs showed large patches of collapse ; these patches affected whole lobules ; they were reddish in colour and sharply marked off from the adjacent normal lobules.

The bronchi leading to these patches contained mucus but no parasites.

No tubercle nodules were seen in any part of the lung.

Bronchial and mediastinal glands normal.

The tissues at the seat of inoculation of the tuberculin 24 hours previously were not thickened or œdematous, and the glands on the same side were normal in size.

Inguinal, Iliac, Lumbar, Prepectoral, and Prescapular Glands.—Normal.

Microscopical Examination.

Smears from :—

Intestinal Nodule.—No tubercle bacilli.

Cervical Gland.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1191	350	E. of Spleen	Killed. 65 days	Healthy.
1192	370	E. of Mesenteric Gland	Killed. 65 days	Healthy.

PIG 56.

Age—6 to 7 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of milk—1·36 cc.

Number of tubercle bacilli—100,000.

Killed—August 26th, 1904.

Duration of Experiment—43 days.

Clinical History.

The animal showed no signs of illness during experiment.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - - -	1	3	0
August 26th, 1904 - - - - -	1	3	10

Gain in weight.—10 lbs.

Average weekly increase.—2 lbs.

Tuberculin Tests.

August 24th. 41 days after experiment began.—No rise of temperature. Slight local reaction.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Large and Small Intestines, Stomach, Gastric Glands, Portal Glands, Cœliac Glands, Pancreatic Glands.—Normal.

Mesenteric Glands.—A mesenteric gland at the junction of the anterior and middle thirds of the mesentery contained a caseous softened nodule, 5 mm. in diameter, distinctly gritty from calcification. (Tubercle bacilli found.)

Other mesenteric glands normal.

Ileo-Colic Glands.—In one of the ileo-colic glands there was an opaque yellow gritty focus. (No tubercle bacilli found.)

Liver, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

The pleural cavities contained a small amount of clear fluid.

Lungs.—At the anterior end of the left cephalic lobe there were two firm greyish nodules about 3 mm. in diameter ; in the left caudal lobe there were two similar but smaller nodules.

The right anterior lobe showed patches of collapse, and in the right caudal lobe there were two or three nodules similar to those on the left side. These nodules were semi-translucent and homogeneous throughout, resembling those in Pig 64, and were probably parasitic in nature.

Bronchial Glands, Mediastinal Glands.—Normal.

There was slight oedema at the seat of inoculation of the tuberculin, but the adjacent glands were not enlarged.

All other glands were normal in size and appearance.

Microscopical Examination.

Smears from :—

Mesenteric Gland.—Two tubercle bacilli.

Ileo-Colic Gland.—No tubercle bacilli.

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1193	240	E. of Lung Nodule	Killed. 117 days	Spontaneous Tuberculosis.
1194	330	E. of Mesenteric Gland	Killed. 117 days	Spontaneous Tuberculosis.

PIG 54.

Age—16 weeks.

Fed—Once with the tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—1·36 cc.

Number of tubercle bacilli—100,000.

Died—September 6th, 1904.

Duration of Experiment—49 days.

Weights.

	qrs.	lbs.
July 19th, 1904 - - - - - -	1	10
August 30th, 1904 - - - - -	1	7

Loss in weight.—3 lbs.

Average loss per week.—5 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In very poor condition ; skin mangy.

Tongue, Pharynx, Tonsils, Pharyngeal Glands, Left Submaxillary Gland, Cervical Glands.—Normal.

Right Submaxillary Gland.—Normal in size ; contained two small caseating tubercles.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestines.—Normal.

Large Intestine.—The mucous membrane of the large intestine showed several haemorrhagic erosions.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Two small lymphatic glands, lying in relation to the left pillar of the diaphragm (coeliac ?), were indurated and showed on section irregular firm yellow caseated patches surrounded by translucent grey tissue.

The glands in the small omentum and around the pancreas appeared normal.

The Spleen contained about a dozen firm nodules, ranging in size from a No. 4 shot to a small pea ; some were immediately beneath the capsule and caused projections ; others were more deeply situated ; on section they were opaque in the centre, but were not definitely caseous.

Liver.—The capsule of the liver, on the anterior surface, showed numerous exceedingly minute transparent points ; in the substance beneath the capsule there was a considerable number of greyish translucent foci, just visible to the naked eye ; these were probably very early tubercles. Similar foci were seen throughout the substance on section.

Kidneys.—Both kidneys showed in the cortex on the surface scattered greyish white translucent foci, the largest about 1 mm. in diameter ; none seen on section.

Suprarenal Bodies.—Normal.

Lumbar Glands, Iliac Glands, Precrural Glands, Inguinal Glands.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—The dorsal part of the caudal lobes was adherent over a small area to a patch (about two inches in diameter) of soft reddish granulation tissue on the chest wall ; this patch was thoroughly adherent to the costal pleura, but the lung was fairly readily torn away from it.

The lungs were very heavy, particularly the right, which was larger than the left. Both lungs were congested, the right lobes intensely (the body was found lying on the right side).

The right caudal lobe was semi-solid, and between the fingers felt full of irregular nodules. The surface was mottled with yellow and bluish black areas. On the dorsal surface the pleura, where it had adhered to the chest wall, was thickened pearly white and fibroid ; through this thickened patch the lobules of the lung were seen to be mapped out by firm opaque white lymphatic vessels ; radiating from the hilum over the mediastinal surface and on to the dorsal surface there were numerous thickened and tuberculous lymphatic vessels.

On section of this lobe firm tuberculous masses were seen scattered throughout, some occupying whole lobules, others surrounding the larger bronchi ; they consisted of compact grey translucent tissue penetrated with streaks and foci of caseation ; between these masses there were numerous grey tubercles with minute opaque necrotic centres.

The anterior lobes of the right lung, and both lobes of the left, were packed with grey tubercles from 1 to 2 mm. in diameter, most of which had necrotic centres . in addition to the latter tubercles the lung parenchyma of all the lobes showed very numerous minute grey foci, which were no doubt very early tubercles.

In the midst of the left caudal lobe there was a tuberculous mass close to, and partly encircling, the primary bronchus.

On the mediastinal surface of the latter lobe there were a few thickened lymphatic vessels. The substance of the lung was abnormally firm, reddish in colour and œdematous, but was still crepitant.

The bronchi were full of blood-stained mucus; the mucous membrane of the trachea and bronchi showed no sign of tuberculosis.

Bronchial Glands.—The bronchial glands were enlarged and indurated and on section showed firm translucent grey tissue surrounding irregular yellowish caseated patches.

Mediastinal Glands.—Were slightly enlarged and showed early foci of caseation.

Minute tubercles were seen on the mediastinal pleura and the pleural surface of the pericardium.

On the pleura covering the last five ribs, on the right side, there were complete rows of tuberculous granulations, in which little hard tubercles could be felt; more anteriorly there were numerous miliary tubercles; on the left side a few small tuberculous growths were seen.

The tendon of the diaphragm was studded with hard pearly tubercles, the largest the size of a pin's head; on the pleura covering the muscle on the right side there were some slightly larger tubercles, which were surrounded by a development of vegetations; a few similar vegetations were also seen on the pleura covering the central tendon.

The pericardial sac contained blood-stained serum.

Heart Muscle and Valves.—Normal.

Prescapular Glands, Prepectoral Glands, Glands at entrance to Thorax.—Normal.

Microscopical Examination.

Smears from:

Submaxillary Gland.—Moderate number of tubercle bacilli.

Coeliac Gland.—Very numerous tubercle bacilli.

Lung.—Tubercle bacilli moderately numerous.

Kidney.—No tubercle bacilli.

GUINEA-PIG INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1210	220	E. of Liver	Died 39 days	General Tuberculosis.
1211	220	E. of Lung	Died 19 days	General Tuberculosis.
1212	—	E. of Spleen	Died 23 days	General Tuberculosis.

PIG 62.

Age—6 to 7 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—1·36 cc.

Number of tubercle bacilli—100,000.

Killed—September 8th, 1904.

Duration of Experiment—56 days.

Clinical History.

There no signs of ill-health during the experiment.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904	1	2	4
September 8th, 1904	1	3	0

Gain in weight.—24 lbs.

Average weekly gain.—3·29 lbs.

Tuberculin Test.

September 6th. 54 days after experiment began.—Slight rise of 0·7°C., twenty-one hours after inoculation.

POST-MORTEM EXAMINATION.

Condition.—Very good.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Retropharyngeal Glands, Cervical Glands, Thyroid.—Normal.

Abdomen:

Omentum, Peritoneum.—Normal

Large and Small Intestines.—Normal throughout.

Mesenteric Glands.—Towards the posterior end of the mesentery there was a slightly enlarged nodular gland, through the capsule of which several little yellow foci could be seen. On section the gland showed in the centre a chalky white cheesy caseous mass, 8 mm. in diameter, easily shelled out from the gland substance and distinctly gritty; in other parts of the gland there were scattered a number of yellow gritty foci embedded in what appeared to be normal gland tissue.

All other mesenteric glands were normal.

The glands in the small omentum (portal), the coeliac, and all those in and around the pancreas, were normal.

Ileo-Colic Glands.—An ileo-colic gland contained a caseous nodule 1 cm. in diameter, similar to that seen in the mesenteric gland.

Colic Glands, Liver, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax:

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the thin posterior margins of the caudal lobes there were several hard translucent nodules similar to those described in Pigs 64 and 56; these showed no sign of caseation. Some of the lobules in which the nodules occurred were firm semi-solid and pinkish red in colour; the rest of the lungs was normal.

Bronchial Glands. Mediastinal Glands.—Normal.

Lumbar Glands, Iliac Glands, Superficial Inguinal Glands, Precrural Glands, Prepectoral Glands, Prescapular Glands.—Normal.

Microscopical Examination.

Mesenteric Gland Emulsion.—Showed numerous tubercle bacilli.

Animals Inoculated.

A guinea-pig inoculated with an emulsion made from the mesenteric gland was killed in 69 days and found to have slight tuberculosis.

PIG 74.

Age—9½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of milk—13·6 cubic centimetres.

Number of tubercle bacilli—100,000.

Killed—August 25th, 1904.

Duration of Experiment—42 days.

Clinical History.

The pig remained well during the experiment.

Weights.

	lbs.
July 19th, 1904 - - - - - - -	24
August 25th, 1904 - - - - - - -	19

Loss in weight.—5 lbs.

Tuberculin Test.

August 24th, 1904. 41 days after the experiment began.—Rise of temperature 0·9°C. Slight local œdema.

POST-MORTEM EXAMINATION.

Body.—In poor condition.

Tongue, Tonsils, and Pharynx.—Normal.

Left Retro-Pharyngeal Gland.—Normal.

Right Retro-Pharyngeal Gland.—Enlarged to about three times the normal and indurated, showed on section firm translucent tissue scattered throughout which were little irregular foci of caseation.

Submaxillary Glands.—Two left submaxillary glands were enlarged and similarly affected.

One right submaxillary gland had a similar appearance, but was more extensively caseated; a second gland on this side contained a small nodule in a state of early caseation.

The tissues around the base of the right ear were thickened and œdematous (tuberculin).

Cervical Glands.—The right cervical glands were greatly enlarged and œdematous, but showed no tuberculosis. The left were normal.

Abdomen :

On the parietal peritoneum on the left side there were two hemispherical pearly tubercles each about the size of a pin's head.

Omentum.—Normal.

Stomach and Small Intestines.—Normal.

The large intestine showed beneath the mucous membrane numerous cysts, the size of small peas, filled with greenish yellow contents.

Gastric, Mesenteric, Ileo-Colic, Colic, Portal, Cœliac and Pancreatic Glands.—Normal.

Liver.—In the substance of the liver near the margin immediately beneath the capsule there were two spherical pale whitish tubercles, one 3 mm., the other 1 mm. in diameter; the tubercles did not show central necrosis.

Spleen.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Thorax :

Heart and Pleura.—Normal.

Lungs.—Substance spotted with petechial hæmorrhages; in each cephalic lobe there was a minute translucent tubercle; in the right middle lobe there were two tubercles, one 3 mm. in diameter just beginning to necrose, the other a mere speck; the right caudal lobe contained two hard pearly tubercles the size of a No. 4 shot; the left caudal lobe showed four tubercles, three on the surface and one in the depth; one of these was 3 mm. in diameter and was opaque yellowish white in the centre; the others were smaller and translucent throughout.

Bronchial and Mediastinal Glands.—Normal.

Prescapular, Prepectoral, Lumbar, Iliac, Inguinal and Precrural Glands.—Normal.

Microscopical Examination.

Smears from :—

A Lung Tubercle.—Three tubercle bacilli.

Submaxillary Gland.—Numerous tubercle bacilli.

The Secretion from a Tonsillar Crypt.—No tubercle bacilli but numerous other organisms.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1184	340	E. of Liver	Died 50 days	General Tuberculosis.
1185	440	E. of Lung	Killed 118 days	Healthy.
1186	330	E. of Spleen	Killed 118 days	Healthy.
1187	330	E. of Mesenteric Gland	Died 15 days	Slight Tuberculosis.

PIG 64.

Age—6 to 7 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Killed—August 25th, 1904.

Duration of Experiment—42 days.

Clinical History.

There were no signs of illness during the experiment.

Weight.

	cwt.	qrs.	lbs.
July 19th, 1904 - - -	1	0	12
August 25th, 1904 - - -	1	1	4

Increase in weight.—20 lbs.

Average weekly increase.—3·7 lbs.

Tuberculin Test.

August 24th, 1904. 41 days after the experiment began. No rise of temperature. Good local reaction.

POST-MORTEM EXAMINATION.

Body.—Well nourished.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Pharyngeal Glands, Cervical Glands, Thyroid.—Normal.

Abdomen :

Omentum.—In the centre of the omentum there was a thin-walled yellow cyst, the size of a marble, with thick yellowish white purulent contents (probably parasitic); no tubercle bacilli were found in a smear made from the pus.

Stomach, Large Intestine.—Normal.

Small Intestine.—The mucous membrane of the small intestine was deeply congested in patches, but showed no sign of tubercle.

Cœliac Glands, Portal Glands, Mesenteric Glands.—Normal.

Ileo-Colic Glands.—One ileo-colic gland was enlarged and indurated and showed on section grey translucent tissue surrounding small yellowish white patches of caseation; the caseated patches were irregular in outline and somewhat congested.

Colic Glands.—Normal.

Spleen, Liver.—Normal on the surface and on section.

Kidneys.—On stripping off the capsules there were seen scattered over the surface of both kidneys moderately numerous greyish white foci, ranging from 1 to 2.5 mm. in diameter ; these on section were found to extend about their own diameter into the cortex and to consist of rather soft whitish material, which was easily scraped away with the tip of a knife. The larger of these areas formed very slight elevations on the surface and had a mulberry outline. The foci had not the appearance of tubercles (Guinea-pig inoculated).

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—The posterior parts of the caudal lobes were beset with solid nodules ranging from 1 up to 6 and 7 mm. in diameter ; the majority were situated deep in the substance of the lung, but some caused subpleural projections ; they were more numerous in some sets of lobules than in others and appeared to correspond in their distribution to that of certain bronchi.

On section the nodules were greyish semi-translucent and homogeneous, resembling gland tissue ; embedded in the centres of some of them there were seen short slender whitish worms. Several slender worms were found in the bronchi leading to the affected lobules. The rest of the lung was normal.

Left Bronchial Gland.—In the substance of the left bronchial gland there was a small nodule, similar to those in the lung, in the centre of which a minute worm was seen.

Right Bronchial Gland, Mediastinal Glands.—Normal.

Uterus, Ovaries.—Normal.

Inguinal Glands, Iliac Glands, Lumbar Glands, Prepectoral Glands, Left Prescapular and Cervical Glands.—Showed no tuberculosis.

The tissues at the base of the right ear were thickened and œdematous (tuberculin injection).

Right Prescapular and Cervical Glands.—Were enlarged and oedematous.

Microscopical Examination.

Omental Nodule - -	No tubercle bacilli.
Ileo-Colic Gland - -	

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1188	290	E. of Lung	Killed 83 days	General Tuberculosis.
1189	390	E. of Spleen	Killed 118 days	Spontaneous Tuberculosis.
1190	400	E. of Kidney	Killed 83 days	Healthy.

PIG 46.

Age—16 weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 20th, 1904.

Amount of Milk—420 cc.

Number of tubercle bacilli—8,539,860.

Killed—September 2nd, 1904.

Duration of Experiment—44 days.

Clinical History.

The animal showed no signs of illness during experiment.

Weights.

	qrs.	lbs.
July 20th, 1904 - - - - - -	1	24
August 30th, 1904 - - - - - -	2	3

Gain in weight.—7 lbs.

Average weekly increase.—1·16 lbs.

Tuberculin Test.

September 1st, 1904. 43 days after the experiment began.—Negative.

POST-MORTEM EXAMINATION.

In the right anterior lobe of the lung there was a small patch of collapse, near which were three small semi-translucent nodules resembling small glands; with this exception all the organs and lymphatic glands had a normal appearance.

A guinea-pig was inoculated with an emulsion made from two of the above nodules and remained healthy after a period of 91 days.

PIG 76.

Age—15 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 20th, 1904.

Amount of Milk—420 cc.

Number of tubercle bacilli—8,539,860.

Killed—September 2nd, 1904.

Duration of Experiment—44 days.

Clinical History.

The animal remained in apparent good health during the experiment.

Weights.

	cwt.	qrs.	lbs.
July 20th, 1904 - - - - -	2	1	16
August 30th, 1904 - - - - -	2	2	0

Gain in weight.—12 lbs.

Average weekly increase.—2 lbs.

Tuberculin Test.

September 1st, 1904. 43 days after the experiment began.—Negative.

POST-MORTEM EXAMINATION.

No sign of tuberculosis. Organs and glands all perfectly healthy.

PIG 84.

Age—7 to 8 weeks.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc. of a 1 in 1,000 dilution.

Number of tubercle bacilli—10,000. (Emulsion mixed with sterilised milk and given with ordinary food.)

Killed—January 2nd, 1904.

Duration of Experiment—131 days.

Clinical History.

There were no signs of illness during the experiment.

Weights.

	qrs.	lbs.
August 30th, 1904 - - - - - -	0	26
January 2nd, 1905 - - - - - -	2	2

Gain in weight.—1 qr. 4 lbs.

Average weekly increase.—1·85 lbs.

Tuberculin Test.

December 16th, 1904.—114 days after the experiment began. Positive. Rise of temperature 1·0 °C.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tonsils, Pharynx.—Normal.

Intestines. — The small intestine contained about twenty-four round worms; there was no sign of tuberculosis.

Submaxillary Glands, Pharyngeal Glands, Cervical Glands, Mesenteric Glands, Colic Glands, Spleen, Liver, Kidneys, Suprarenal Bodies, Lungs, Thoracic Glands, Pleura, Peritoneum.—Normal.

All other lymphatic glands, not mentioned above, were normal.

PIG 60.

Age—6 to 7 months.

Fed—Once with tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of milk—0·136 cc.

Number of tubercle bacilli—10,000.

Killed—November 16th, 1904,

Duration of Experiment—120 days.

Clinical History.

The animal remained in good health throughout the experiment.

Weights.

	cwt.	qrs.	lbs.
July 19th, 1904 - - - - -	1	0	10
November 16th ,1904 - - -	1	3	7

Gain in weight.—2 qrs. 25 lbs.

Average weekly increase.—4·7 lbs.

Tuberculin Tests.

None after experiment.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Cervical Glands, Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestine, Large Intestine.—Normal throughout.

Gastric Glands, Mesenteric Glands, Colic Glands.—Normal in size and appearance.

Ileo-Colic Glands.—Four ileo-colic glands, normal in size, showed on the surface just under the capsule and on section discrete caseous and softened foci, ranging in size from that of a mustard seed to that of a pin's head ; three of the glands contained about half a dozen foci each ; in the fourth they were rather more numerous ; a few of the larger foci were slightly gritty.

Spleen, Liver, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—The lungs showed at the extreme margins of the caudal lobes a small number of firm nodules, ranging from 2 to 5 mm. in diameter ; on section they were grey translucent and homogeneous throughout. Embedded in the midst of some of them were slender whitish thread-like bodies, 3 to 4 mm. in length. The rest of the lungs was normal.

Bronchial Glands, Mediastinal Glands.—Normal.

Uterus, Ovaries.—Normal.

Popliteal Glands, Inguinal Glands, Precrural Glands, Iliac Glands, Lumbar Glands, Pancreatic Glands, Cœliac Glands, Prescapular Glands, Prepectoral Glands.—Normal.

Microscopical Examination.

A smear made from two or three caseous foci from an ileo-colic gland showed two tubercle bacilli.

GUINEA-PIGS INOCULATED.

(Guinea-pig 1349 was inoculated subcutaneously. Guinea-pigs 1350 and 1351 intraperitoneally).

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1349	220	Ileo-Colic Gland	Killed 147 days	General Tuberculosis.
1350	220		Killed 147 days	Tuberculosis.
1351	190	E. of Lung (Two Nodules)	Killed 147 days	Healthy.

PIG 48.

Age—16 weeks.

Fed—Once with the tuberculous milk of Cow 164.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Died—October 10th, 1904.

Duration of Experiment—89 days.

Clinical History.

This pig was one of a batch, all of which were affected with an intractable eczematous (mangy) condition of certain regions of the skin.

After experiment the mangy condition became progressively worse, spreading over the whole surface of body, and probably contributing to the early death of the animal.

Weights.

	qrs.	lbs.
July 29th, 1904 - - - - - -	1	17
October 10th, 1904 - - - - - -	0	23½

Loss in weight.—21½ lbs.

Average weekly loss.—2 lbs.

Tuberculin Test.

Not tested during the experiment.

POST-MORTEM EXAMINATION.

Carcass.—Very emaciated ; skin thickened, fissured, and in many places ulcerated or covered with masses of dried secretion.

Tonsils.—The left tonsil was extensively ulcerated and deeply excavated, the whole mucous surface being practically entirely destroyed ; the margins of the ulcerated areas were raised irregular and thickened ; the floors covered with yellow shreddy necrotic material.

On section the substance of the tonsil was caseous and necrotic.

The right tonsil was normal, except that many of the crypts were plugged with secretion.

Tongue.—At the base of the tongue, on the left side, there were three or four small ulcers with yellow necrotic floors (caused by contact with left tonsil).

A gland close to the left tonsil, lying above and slightly in front of the left cornu of the hyoid bone, was enlarged to the size of a small filbert ; on section it showed in the centre a dense bright yellow necrotic mass, and around the margins firm translucent tissue in a state of caseation.

Sublingual Glands.—A sublingual gland on the left side was enlarged indurated and caseating.

Submaxillary Glands.—The submaxillary glands on the left side, three in number, were fused together to form a mass 2 in. by 1½ in. by 1 in. ; on section they consisted throughout of dense yellow caseo-necrotic tissue, showing here and there points of congestion, but no calcareous foci.

A gland superior to the above group (nearer the articulation of the jaw), the size of a filbert, was indurated and extensively caseated, showing very little translucent tissue.

Pharyngeal Glands.—The left retro-pharyngeal gland was slightly enlarged and almost entirely composed of firm grey tissue in a state of early caseation.

Right Submaxillary Glands, Right Pharyngeal Glands, Cervical Glands, Prescapular Glands, Prepectoral Glands, Thymus.—Normal.

Abdomen :

Parietal Peritoneum.—Normal.

Omentum.—The omentum near the spleen showed a small caseating nodule.

Spleen.—On the concave surface there was a series of flattened mushroomed tubercles from 1 to 2·5 mm. across ; the tubercles were opaque and yellow in the centre. On the convex surface there were three or four similar tubercles.

The substance of the spleen contained four large nodules, ranging from 6 mm. up to 1·5 cm. in diameter, and three or four smaller ones about 4 mm. in diameter. On section these nodules showed in the centre firm yellow necrotic tissue, and around the margins reddish tissue (resembling splenic tissue) studded with yellow foci.

Liver.—On the surface of the liver, where two of the lobes came into contact, there were some small tuberculous granulations ; in the substance, immediately beneath the capsule, there were numerous nodules, the largest about 3 mm. in diameter, which on section showed yellow caseous centres and translucent margins ; the nodules were more numerous on the concave surface. In addition to the large nodules there were numerous grey translucent tubercles, about 0·5 mm. in diameter.

Portal Glands.—In the small omentum there were four slightly enlarged and indurated glands, which on section showed scattered caseous foci.

One cœliac gland and one pancreatic gland resembled the portal.

Kidneys, Suprarenal Bodies.—Normal.

Stomach.—On the serous surface of the stomach, in contact with the spleen, there was a cluster of loosely attached nodules similar to those on the surface of the spleen.

Small Intestine, Large Intestine.—Normal throughout.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Thorax :

Lungs.—The lungs contained very numerous nodules, ranging in size from 1 up to about 4 mm. in diameter ; the nodules were hard and translucent at the periphery, and opaque yellow but not gritty in the centre ; they were much more numerous in the right lung than in the left.

The fringes around the margins of the lungs, particularly of the posterior lobes, showed numerous hard tubercles.

The Bronchial Glands on both sides were slightly enlarged and showed on section firm translucent tissue beset with foci of caseation.

Mediastinal Glands.—The mediastinal glands were also slightly enlarged indurated and in a state of early caseation.

The ventral mediastinal glands were similarly affected.

Diaphragm.—On the pleural surface of the tendon of the diaphragm, chiefly on the right side, there was a number of hard nodules, opaque yellow in the centre, ranging in size from 1 up to 2 and 3 mm., in diameter ; on the lower part of the tendon of the diaphragm there were four large nodules, the largest 1·5 cm. long by 8 mm. broad, consisting of firm pinkish-grey translucent tissue penetrated with a yellow network.

On the peritoneal surface, on the right side, there were numerous small nodules, similar to those on the pleural surface.

Pleura.—On the parietal pleura, near the posterior end of the sternum, there were three firm flattened and mushroomed pinkish tuberculous growths ; there was a similar growth in the twelfth interspace near the vertebral column.

The pericardial sac contained a little serous fluid

Heart Muscle and Valves.—Normal.

Right Precrural Gland.—Contained a caseating nodule about 5 mm. in diameter.

Left Precrural Gland, Right and Left Inguinal Glands, Lumbar Glands, Iliac Glands.—Normal.

Microscopical Examination.

Smears from :—

Portal Gland.—Tubercle bacilli.

Submaxillary Gland.—Numerous tubercle bacilli.

Right Precrural Gland.—A few tubercle bacilli.

Bronchial Gland.—Moderately numerous tubercle bacilli.

Lungs.—A few tubercle bacilli.

Liver.—Three tubercle bacilli

Spleen.—Two tubercle bacilli

PIG 66

Age—6 to 7 months.

Fed—Once with the tuberculous milk of Cow 161.

Date—July 14th, 1904.

Amount of Milk—13·6 cc.

Number of tubercle bacilli—1,000,000.

Killed—October 12th, 1904.

Duration of Experiment—90 days.

Clinical History.

No signs of ill-health were noticed during the experiment.

Weights.

	cwt.	qrs.	lbs
July 19th, 1904 - - - - - -	1	0	6
October 12th, 1904 - - - - -	1	2	17

Gain in weight.—2 qrs. 11 lbs.

Average weekly increase.—5·6 lbs.

Tuberculin Test.

September 6th, 1904. 54 days after the experiment began.—Dose of tuberculin 2·0 cc. Rise of temperature 2·3°C. Large local swelling, the skin over which subsequently sloughed.

POST-MORTEM EXAMINATION.

Carcass.—In good condition ; very fat.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands, Thyroid.—Normal.

Abdomen :

Small Intestine, Large Intestine.—Normal throughout.

Gastric Glands. Mesenteric Glands, Colic Glands.—Normal.

Ileo-Colic Glands.—One ileo-colic gland measured $1\frac{1}{2}$ in. by $\frac{7}{8}$ in. by $\frac{2}{3}$ in. : on section it was closely beset with caseous and softened nodules, which practically entirely replaced the gland substance ; a second ileo-colic gland showed at one extremity a small group of caseous and softened nodules.

A gland near the root of the mesentery (superior mesenteric ?) contained three yellowish-white caseous tubercles, the size of pins' heads.

In the small omentum there was a group of four glands ; one contained four or five caseating nodules, the largest 3 mm. in diameter ; two each contained one caseous nodule ; the fourth was normal.

Liver.—Showed immediately beneath the capsule four grey tubercles, each about the size of a mustard seed, one of which was slightly opaque in the centre.

In the depth of the liver there were two tubercles, the size of pins' heads, with yellowish calcareous centres.

Kidneys.—The left kidney showed in the cortex near the surface a minute grey translucent speck.

The right kidney and suprarenal bodies were normal.

Spleen.—Normal on the surface and on section.

Lumbar Glands, Iliac Glands, Precrural Glands, Inguinal Glands.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the thinned out parts of the caudal lobes there was a series of nodules, the largest the size of a pea, occurring singly and in groups ; on section the nodules consisted throughout of firm grey translucent tissue (resembling gland tissue), embedded in which were short slender worm-like parasites.

In the left cephalic lobe there were one or two similar nodules and several of the lobules showed patches of consolidation.

No tubercle nodules seen in any part of the lung.

Bronchial Glands, Mediastinal Glands.—Normal.

Ovaries, Fallopian Tubes, Prescapular Glands, Prepectoral Glands.—Normal.

Microscopical Examination.

Smears from :—

Liver,
Gland in Omentum } No tubercle bacilli.

Ileo-Colic Gland (single nodule).—Two tubercle bacilli.

Emulsion of Large Ileo-Colic Gland.—Three tubercle bacilli.

GUINEA-PIGS INOCULATED.

INTRAPERITONEAL INOCULATIONS.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1313	240	E. of Spleen	Killed 71 days	Healthy.
1314	230	E. of Ileo-colic Gland	Died 57 days	General Tuberculosis.

PIG 80.

Age—6 to 7 weeks.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150 inoculated with milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million. (The emulsion was mixed with sterilised milk and given with the ordinary food.)

Killed—When very ill, January 2nd, 1905.

Duration of Experiment—131 days.

Clinical History.

The animal gradually became "hide bound" (first noticed about the middle of October), and after a time ceased to grow; in the last two or three weeks of life the respirations were greatly increased, and finally became very laboured and noisy, the latter apparently from nasal obstruction.

Weights.

From August 30th to December 7th there was a steady gain in weight of 1 qr. 2 lbs., from December 7th to January 2nd the animal lost 15 lbs.

	qrs.	lbs.
August 30th, 1904 - - - -	0	25
September 20th, 1904 - - - -	1	4
October 18th, 1904 - - - -	1	21
November 8th, 1904 - - - -	1	23
December 7th, 1904 - - - -	1	27
January 2nd, 1905 - - - -	1	12

Gain on initial weight.—15 lbs.

Tuberculin Test.

December 16th, 1904. 124 days after experiment began.—Positive. Rise of temperature 1·2° C. Dose of tuberculin 2·0 cc.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Tongue.—Normal.

Tonsils.—Each tonsil showed on the surface a small puckered scar; in the right tonsil the tonsillar tissue showed underneath the scar a pea-sized firm yellow necrotic nodule; in the left there was a series of yellowish white foci.

Pharynx.—In the vault of the pharynx, immediately behind the septum nasi, there was a deep excavated ulcer with very irregular yellow necrotic walls.

On the nasal mucous membrane, near the posterior extremity of the inferior turbinate bone, there was a circular ulcer (about 5 mm.) with slightly raised margins and necrotic floor.

Submaxillary Glands.—On the right side the glands were fused together into a mass measuring 2½ in. by 1¾ in. by 1¼ in. On section the mass was partly converted into greenish yellow cheesy material and partly composed of dense brittle caseated tissue, penetrated with opaque white gritty streaks and foci; the latter tissue had a greenish tinge around the peripheral parts and was pinkish in the central parts.

Attached to the above mass there was a small gland consisting of translucent fibroid tissue beset with yellow foci of necrosis.

On the left side there was a slightly smaller mass, the glands composing which were caseous throughout but not softened.

Pharyngeal Glands.—The right pharyngeal gland was enlarged to the size of a small hen's egg; the left was lobular in outline and measured 1⅓ in. by 1 in. by ¾in. Both were caseous throughout and gritty on section.

Cervical Glands.—In the middle of the neck, on the right side, extending from the mastoid process to the level of the thyroid cartilage, there was a chain of five glands, the largest the size of a pigeon's egg: on section they resembled the left submaxillary glands; and two showed signs of breaking down in the central parts.

On the left side there were four glands slightly smaller than those on the right, similarly affected.

Thyroid Body.—Normal.

Abdomen:

Omentum. — Showed sparsely scattered opaque yellow tubercles, the largest the size of a wheat grain.

Peritoneum.—Similar, but more numerous, tubercles were seen on the peritoneum between the coils of the large intestine.

Stomach, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands.—In the anterior part of the mesentery there were three glands caseous throughout and beginning to soften; one of the glands was the size of a broad bean, the others that of peas; a fourth gland contained a caseous focus; the rest of the glands were normal in size and appearance.

Colic Glands.—One in the midst of the coils of the large intestine, the size of a pea, was opaque and caseous throughout.

The Spleen was little if at all enlarged. On the capsule, particularly on the convex surface, there were numerous translucent mushroomed tubercles; projecting under the capsule and partly embedded in the substance were five firm nodules, ranging in size from a small pea to a large marble (the latter projected more than half its diameter).

On section the nodules were opaque yellowish white in the centre and greyish red around the margins: in the substance of the spleen there were two or three small nodules, which did not cause projections on the surface.

The Liver was purplish black in colour. On the surface there were numerous flat grey translucent growths, 2 to 3 mm. in diameter; these covered small caseous and gritty tubercles embedded in the substance: on the convex surface at one part they were aggregated closely together, and from them recent strands of connective tissue passed to the diaphragm. In the depth of the liver there were a few scattered opaque miliary tubercles; the substance of the liver showed besides very numerous minute grey foci.

The Portal Glands, in the small omentum, three in number, were enlarged indurated and showed on section translucent fibroid tissue surrounding firm caseous nodules and irregular caseous masses.

Cœliac Glands.—Six in number, the largest the size of a filbert, resembled the portal.

Kidneys—The left kidney showed about half a dozen grey tubercles in the cortex.

In the cortex of the right kidney there were a few minute grey tubercles and one, the size of a shot, opaque in the centre.

The pelves and calyces of both kidneys were dilated. The bladder was not examined, but no obstruction to the ureters was found.

Suprarenal Bodies.—Normal.

Thorax:

Lungs.—On opening the thorax the right lung was seen to be almost universally adherent to the chest wall and diaphragm; the anterior half of the lung was so thoroughly adherent to the parietal pleura that it was impossible to separate one from the other without tearing; the same applies in less degree to the caudal lobe and diaphragm ; the left lobe was adherent at various places by more recent adhesions.

When removed from the thorax, the surface of the right cephalic lobe was seen to be very roughened and irregular ; the surface of the caudal lobe showed numerous flattened warty growths, singly and in groups, situated chiefly near the margins ; on the surface of the left lung there were similar tuberculous growths, but not so abundant. Around the margins of the lungs there were continuous rows of thick pinkish fleshy caseating growths.

On longitudinal section the anterior half of the right lung was entirely solid, being composed of firm grey translucent lobular masses ; in the caudal lobe there were similar masses of various sizes, but here they were surrounded by congested crepitant lung tissue, and did not occupy whole lobules. Section through the left lung showed it to resemble the right caudal lobe, with the exception that the masses were a little smaller and there were numerous discrete tubercles ; the nodules showed a relatively slight amount of central necrosis.

Bronchial Glands.—Very greatly enlarged dense and caseous throughout, the cut surfaces being appreciably gritty from calcification.

Mediastinal Glands.—Dorsal mediastinal glands were similarly but not so extensively affected.

Ventral mediastinal grands were greatly enlarged dense and practically caseous throughout.

Pleura.—On the right side the pleura was greatly thickened, especially in the anterior part, where it measured 1 cm. in greatest thickness ; it consisted of pinkish fibroid tissue beset with irregular masses of dense caseated tissue ; the surface was warty.

The left pleura was covered with large patches of growth similar to that on the right side.

Diaphragm.—The pleural surface on the right side resembled the right parietal pleura ; the left side was not so severely affected, the tuberculous growths being disposed chiefly around the margins of the tendon.

In the ventral mediastinum, extending from the diaphragm to the enlarged ventral mediastinal glands, and partly enclosing the heart, was a large mass of new formed tuberculous tissue, similar to that on the right side of the chest wall.

The peritoneal surface of the diaphragm on the right side was closely covered with hard flattened translucent nodules, the larger of which were opaque in the centre. On the left side there were similar nodules, but much less numerous ; some of the larger ones were here surrounded by connective tissue outgrowths.

Heart.—The pericardial surface of the left ventricle was slightly roughened ; otherwise the pericardium was normal. Heart muscle and valves normal.

Right Prescapular Gland the size of a large bean, was dense and caseating throughout. The left was twice the size and similar on section.

Axillary Glands.—Both axillary glands were enlarged and tuberculous, but not in so advanced a condition of caseation as the prescapular.

Prepectoral Glands were larger and firmer than normal, but showed no opaque foci.

Superficial Inguinal Glands.—Normal.

Left Precrural Gland contained a pea-sized caseating nodule ; the right three or four similar but smaller nodules.

Lumbar Glands.—Resembled the portal.

Iliac Glands, Testicles.—Normal.

Microscopical Examination.

Spleen.—One tubercle bacillus seen.

Right Tonsil - -	No tubercle bacilli.
Liver - - -	
Diaphragm - -	

PIG 78.

Age—15 months.

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with the milk of Cow 164.

Date—August 24th, 1904.

Amount of Emulsion—0·5 cc.

Number of Tubercle Bacilli—10·15 million. (The emulsion was mixed with sterilised milk and given with the ordinary food.)

Killed—January 3rd, 1905.

Duration of Experiment—132 days.

Clinical History.

The animal remained in good health throughout the experiment.

Weights.

The animal was weighed every three weeks and on each occasion showed a steady gain in weight.

	cwt.	qrs.	lbs.
August 30th, 1904 - - - - - -	2	1	22
January 3rd, 1905 - - - - - -	2	2	13

Gain in weight.—1 qr. 19 lbs.

Average weekly increase.—2·5 lbs.

Tuberculin Test.

December 16th, 1904. 124 days after the experiment began. Positive. Rise of temperature 1·5°C.

POST-MORTEM EXAMINATION.

Carcass.—In splendid condition ; very fat.

Tonsils, Tongue, Pharynx, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Cervical Lymphatic Glands, Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum, Large Intestine, Small Intestine.—Normal.

Gastric Glands.—One of the glands along the lesser curvature of the stomach showed an opaque hard yellowish white slightly gritty nodule, about 2·5 mm. in diameter.

Mesenteric Glands.—In the middle two-fourths of the mesentery five of the mesenteric glands were found to contain hard masses ranging in size from a sparrow's egg to that of a broad bean ; these were irregular and nodular on the surface and on section showed hard dry greyish white caseated tissue, very gritty from calcification ; there was a very slight amount of fibrous tissue surrounding the masses. A gland near one of the above showed a small caseous nodule. The rest of the mesenteric glands were normal.

Ileo-Colic Glands, Colic Glands.—Normal.

Liver.—Showed under the capsule on the anterior surface three opaque yellow foci about the size of mustard seeds. No foci seen on section.

Portal Glands.—In the small omentum there were four glands ranging in size from a French bean to a filbert; three of the glands each contained a hard irregular yellowish white slightly gritty nodule, the largest about the size of a pea; the fourth gland contained three or four similar nodules.

Spleen.—Normal.

Kidneys.—Showed on the surfaces numerous pale grey points, which on section were found to extend a variable distance into the cortices as radial streaks.

Suprarenal Bodies, Lumbar Glands, Iliac Glands. Pancreatic Glands.—Normal.

Thorax:

Heart, Pericardium, Pleura.—Normal.

Lungs.—In the left lung under the pleura there was a spherical grey body the size of a mustard seed. In the right lung, under the pleura covering an interlobular septum, there was a nodule 2 mm. in diameter, composed of tissue closely resembling glandular tissue.

Bronchial Glands, Dorsal Mediastinal Glands. Ventral Mediastinal Glands—Normal.

Prescapular Glands, Prepectoral Glands, Precrural Glands, Axillary Glands.—Normal.

Uterus, Ovaries.—Normal.

Microscopical Examinations.

Gastric Gland, *Mesenteric Gland (Emulsion)*	No tubercle bacilli.

Portal Gland.—One tubercle bacillus (?).

Lung.—(*Small body in left*); no tubercle bacilli.

GUINEA-PIGS INOCULATED.

Intraperitoneal Inoculations.

Number of Guinea-pig.	Weight in Grammes.	Material Injected.	Duration of Life.	Result.
1402	200	E. of Liver Foci.	Killed 99 days.	General Tuberculosis.
1403	210	E. of Mesenteric Gland.	Died 52 days.	General Tuberculosis

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DOG 12. (Puppy.)

Fed—Once with tuberculous milk of Cow 164.

Date—July 26th, 1904.

Amount of Milk—28·2 cc.

Number of tubercle bacilli—1,000,000

Killed—September 5th, 1904.

Duration of Experiment—41 days

Tuberculin Test.

September 1st, 1904.' Negative. Dose of tuberculin 0·5 cc.

POST-MORTEM EXAMINATION.

There was no sign of tuberculosis in any of the organs or glands.

DOG 6. (Adult Collie.)

Fed--Once with tuberculous milk of Cow 164.

Date—July 16th, 1906.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—August 28th, 1904.

Duration of Experiment—43 days.

Tuberculin Test.

August 24th, 1904.—Negative. Dose of tuberculin 0·5 cc.

POST-MORTEM EXAMINATION.

Body.—In very good condition.

Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Under the peritoneum there were about half-a-dozen yellow foci which projected slightly above the surface; on section these did not appear to extend into the gland substance and were possibly of a fatty nature (no tubercle bacilli were found in a smear preparation); the substance of the glands was quite normal in appearance.

The *Right Kidney* showed on the surface two greyish white foci which on section extended into the cortex as radial streaks.

Other organs and glands were normal.

Microscopical Examination.

Paraffin sections of the mesenteric glands and kidney revealed no tubercle bacilli or structure suggestive of tuberculosis.

DOG 16. (Puppy.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—October 6th, 1904.

Duration of Experiment—44 days.

Tuberculin Test.

October 4th, 1904. 42 days after the experiment began.—Rise of temperature 0·5°C. Slight local thickening, no constitutional disturbance. Dose of tuberculin 2·0 cc.

POST-MORTEM EXAMINATION.

The subcutaneous tissues, over an area four inches in diameter, around the seat of inoculation of tuberculin (48 hours previously) were intensely hæmorrhagic and slightly œdematous.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

The peritoneal cavity contained an excess of clear serous fluid.

Omentum, Peritoneum, Stomach, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands.—A gland in the posterior part of the mesentery showed in the cortex just under the capsule two or three greyish white translucent foci not larger than the head of a pin ; these foci were soft and when cut into were not easily differentiated from the gland tissue in which they were embedded ; they may have been early tubercles. The gland in which they were contained was not enlarged or indurated.

Other mesenteric glands and the colic glands were normal in size and appearance.

Spleen.—Normal.

Liver.—The liver showed in the substance sparsely scattered opaque whitish, or yellowish white foci, about the size of a grain of sand ; these foci could be shelled out from the liver substance ; a smear made from two or three showed no tubercle bacilli, but a few organisms stained blue.

Portal Gland.—Normal.

Kidneys.—Both kidneys showed in the cortex numerous pale whitish translucent bodies ranging in size from about 0·5 to 1·0 mm. in diameter ; some of these bodies had minute opaque white centres, whilst others contained a little cavity ; the bodies occurred in every part of the cortex, but did not project above the surface of the kidney and were not found in the medullary zones ; they were soft and not readily shelled out. The bodies closely resembled early tubercles, but no tubercle bacilli were found in a smear preparation made from three or four of them.

Suprarenal Bodies, Iliac Glands, Lumbar Glands.—Normal.

Thorax :

Lungs.—The lungs were pinkish in colour and collapsed well. In each lung there were from six to eight dark grey translucent tubercles, the largest the size of a pin's head, felt between the finger and thumb as hard spherical bodies ; they lay chiefly just beneath the pleura, one or two only being found in the depth ; several of the tubercles were surrounded by an areola of intense congestion.

Bronchial Glands, Heart, Pericardium, Pleura.—Normal.

Inguinal Glands, Prescapular Glands.—Normal.

Microscopical Examination.

Smears from :—

Mesenteric Gland Emulsion }
Kidney } No tubercle bacilli.
Liver }

Lung.—Numerous tubercle bacilli, many in clumps ; the bacilli were moderately long, and not beaded.

Guinea-Pigs Inoculated Intraperitoneally.

No. 1299. *With Emulsion of the Mesenteric Gland, showing whitish foci.*—Died in 45 days of general tuberculosis.

No. 1301.—*With Emulsion of Liver* }
No. 1302.—*With Emulsion of Kidney* } Remained healthy.
No. 1300.—*With Emulsion of Lung.* }

DOG 22. (Adult.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—October 6th, 1904.

Duration of Experiment—44 days.

Tuberculin Test.

October 4th, 1904. 42 days after the experiment began. Slight rise of temperature (0·3°C). Slight local thickening, no constitutional disturbance. Dose of tuberculin 5·0 cc.

POST-MORTEM EXAMINATION.

There was a large area of intense congestion in the subcutaneous tissues around the site of inoculation of the tuberculin (forty-eight hours previously).

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Pharyngeal Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach, Small Intestine, Large Intestine, Mesenteric Glands, Colic Glands, Liver, Spleen.—Normal.

Kidneys.—In the cortex of the right kidney there were two greyish white foci, similar to those seen in Dog (Puppy) 16.

Left kidney normal, except that the capsule stripped badly.

Suprarenal Bodies.—Normal.

Thorax :

Lungs.—Contained two hard translucent grey tubercles, the size of pins' heads.

Bronchial Glands, Heart, Pericardium, Pleura.—Normal.

Inguinal Glands, Iliac Glands, Lumbar Glands, Prescapular Glands.—Normal.

Microscopical Examination (Smear Preparations).

Kidney,
Lung Tubercle. } No tubercle bacilli.

A guinea-pig inoculated with an emulsion made from the mesenteric glands remained healthy.

DOG 14. (Puppy.)

Fed—Once with tuberculous milk of Cow 164.

Date—July 26th, 1904.

Amount of Milk—28·2 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 30th, 1904.

Duration of Experiment—127 days.

Tuberculin Test.

November 18th, 1904. 115 days after experiment began.—Positive. Rise of temperature 0·8°C. Dose of tuberculin 2·0 cc.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Small Intestines.—Normal.

Large Intestine.—About the middle of the colon there was a tense submucous nodule, the size of a small pea ; on section it showed a thick white fibrous wall and soft greenish yellow contents.

Mesenteric Glands.—The terminal gland of the series was enlarged to the size of a filbert and hardened ; on section it was composed throughout of tough yellowish white somewhat translucent necrosed tissue, around the marginal parts of which chiefly there were opaque milky white streaks and foci, some of which were just perceptibly gritty : at one part of the gland there was a small space filled with thin greenish purulent fluid. The capsule of the gland was thickened. Other mesenteric glands were normal.

Ileo-Colic Glands.—Normal.

Liver.—On the surface of the liver a minute yellow point was seen. On section this was seen to extend a short distance into the substance as a yellow streak ; it was probably of a fatty nature. No tubercle bacilli were found in a smear preparation made from it. With this exception the liver was perfectly normal.

Portal Gland, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pleura.—Normal.

Lungs.—The left lung showed on the surface beneath the pleura three translucent grey tubercles, the largest the size of a mustard seed.

On the surface of the right lung there were two similar tubercles.

Bronchial Glands.—Appear normal.

Microscopical Examination.

Pus from Mesenteric Gland.—Numerous tubercle bacilli, mostly in clumps.

Liver,
Lung Tubercle } No tubercle bacilli.

Colon Nodule.—No tubercle bacilli, but several large bacilli stained blue.

A guinea-pig, No. 1371, inoculated intraperitoneally with an emulsion made from the mesenteric gland, died in 62 days of general tuberculosis.

DOG 8. (Adult, over 7 years old.)

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 22nd, 1904.

Duration of Experiment—129 days.

Tuberculin Test.

November 18th, 1904. 125 days after experiment began.—Rise of temperature 1·9°C. Dose of tuberculin 4 cc. No constitutional disturbance.

POST-MORTEM EXAMINATION.

Body.—In fair condition.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands, Omentum, Peritoneum, Large Intestine, Small Intestine, Mesenteric Glands, Colic Glands, Spleen.—Normal.

Kidneys.—Capsules strip badly. No tubercles.

Liver.—Normal.

Portal Gland.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—Deeply pigmented, contained two or three small very hard (stony) irregular bodies, which it was impossible to crush.

Bronchial Glands.—Jet black, normal in size, showed no tubercles.

Testicles, Inguinal Glands.—Normal.

Microscopical Examination (Smear Preparations).

Pharyngeal Gland,
Portal Gland, } No tubercle bacilli.
Spleen.

DOG 18. (Puppy, large breed.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million

Killed—January 5th, 1905.

Duration of Experiment—135 days.

Tuberculin Test.

December 16th, 1904. 115 days after experiment began.—Negative. No rise of temperature. Dose of tuberculin, 2·0 cc.

POST-MORTEM EXAMINATION.

Body.—In good condition.

Tonsils, Pharynx, Submaxillary Glands, Retropharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Large Intestine, Small Intestine, Gastric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

Mesenteric Glands.—Two mesenteric glands were enlarged, one to the size of a small filbert, the other to three times that size ; both were elastic and fluctuant and on section exuded a quantity of thin whitish puriform fluid ; when divided the greater part of each gland was seen to be composed of tough milky white spongy or shreddy tissue, in the interstices of which the puriform fluid was contained (numerous tubercle bacilli found).

Spleen, Liver, Portal Glands.—Normal.

Kidneys.—The left kidney showed on the surface three or four grey foci (about 0·5 mm.), one of which was slightly opaque in the centre.

In the right kidney there were two grey foci, both of which showed minute whitish central opacities. Nothing abnormal seen on section.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pleura.—Normal.

Lungs.—Showed under the pleura a few scattered grey transparent tubercles, slightly less than 1 mm. in diameter ; in one lobe there was a nodule about 2 mm. in diameter, which on section was grey translucent, and homogeneous throughout (tubercle bacilli were found in a smear from the latter and also in one from the former).

Bronchial Glands.—Normal in size and appearance.

Lumbar Glands, Iliac Glands, All Peripheral Lymphatic Glands.—Normal.

Microscopical Examination.

Mesenteric Glands.—Two smears. Numerous tubercle bacilli.

Lung.—Two smears. A few tubercle bacilli in each.

Left Kidney.—No tubercle bacilli.

A culture was obtained from the mesenteric gland (*see* Modification Experiments).

DOG 20. (Adult Terrier.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—January 6th, 1905.

Duration of Experiment—136 days.

Tuberculin Test.

December 16th, 1904. 115 days after feeding.—Rise of temperature, 0·9°C. Dose of tuberculin 5·0 cc.

POST-MORTEM EXAMINATION.

Tonsils, Pharyngeal Mucous Membrane, Submaxillary Glands, Cervical Glands.—Normal.

Left Retropharyngeal Gland.—Slightly enlarged and indurated. Contained a small cavity filled with viscid mucoid blood-stained material (a few tubercle bacilli were found in a smear).

Right Pharyngeal Gland, Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands.—Normal in size, on section in the terminal gland a pearly body, the size of a mustard seed, was seen which easily shelled out (no tubercle bacilli, but numerous bacilli stained blue).

Ileo-Colic Glands.—Two in number, one on each side, were not obviously enlarged ; one contained a whitish soft (fibrous) nodule which easily shelled out ; the other a yellowish necrotic focus.

Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Showed under the capsule a translucent tubercle the size of a pin's head (no tubercle bacilli).

Portal Gland.—Normal.

Kidneys.—Both kidneys showed in the cortex, on the surface, numerous grey foci about 1 mm. in diameter ; some of these were whitish in the centre, others appeared to contain a minute cavity.

Suprarenal Bodies.—Normal.

Thorax :

Heart, Pleura, Lungs, Bronchial Glands.—Normal.

Prescapular Glands.—Normal.

Microscopical Examination.

Ileo-Colic Gland.—A moderate number of tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli, several long bacilli stained blue.

Pharyngeal Gland.—Five tubercle bacilli seen after prolonged search.

Liver,
Kidney. } No tubercle bacilli.

A guinea-pig inoculated with an emulsion made from a mesenteric gland (normal to the naked eye) developed general tuberculosis.

CAT 2. (Adult.)

Fed—Once with tuberculous milk of Cow 161.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—August 28th, 1904.

Duration of Experiment—43 days.

Tuberculin Test.

August 24th. 39 days after feeding.—Negative. Dose of tuberculin 0·5" cc.

POST-MORTEM EXAMINATION.

Tonsils and Intestines.—Normal.

Submaxillary, Pharyngeal, Cervical, Abdominal and Thoracic Lymphatic Glands.—Normal.

There was no evidence of tuberculosis in any of the organs.

CAT 6. (Kitten.)

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000

Killed—August 27th, 1904.

Duration of Experiment—42 days.

Tuberculin Test.

August 24th, 1904. 39 days after the experiment began.—Negative. Dose of tuberculin 0·5 cc.

POST-MORTEM EXAMINATION.

Pharynx and Tonsils.—Normal.

Submaxillary and Pharyngeal Glands.—Normal.

Small Intestine.—The terminal Peyer's patch showed a minute ulcer in the mucous membrane; in the submucous tissue under the ulcer there was a firm opaque white caseous patch about 2 mm. in diameter; the peritoneum over it was normal.

The rest of the small intestine and the large intestine were normal.

Mesenteric Glands.—Normal.

Ileo-Colic Glands.—One somewhat flattened gland, half an inch in greatest diameter, showed arranged around the cortex a series of firm greyish white caseous nodules, the majority about 2 mm. in diameter. A small gland on the opposite side of the junction of the ileum and cœcum contained two small caseous nodules.

Colic Glands.—Normal.

Lungs and Bronchial Glands.—Normal.

Spleen, Liver, Portal Gland, Kidneys, Suprarenal Bodies.—Normal.

Microscopical Examination (Smear Preparations).

Intestinal Lesion - -	Numerous tubercle bacilli.
Small Ileo-Colic Gland -	

CAT 16. (Adult.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 161.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—October 8th, 1904.

Duration of Experiment—46 days.

Tuberculin Test.

October 4th. 1904. 42 days after experiment began.—The temperature rose 0·6° C. three hours after injection. Dose of tuberculin, 2·0 cc.

POST-MORTEM EXAMINATION.

There was no sign of tuberculosis in any of the organs or glands.

CAT 18. (Kitten.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—October 8th, 1904.

Duration of Experiment—46 days.

Tuberculin Test.

October, 4th, 1904. 42 days after experiment began. Temperature rose 0·9°C. six hours after injection. Dose of tuberculin 1·0 cc.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Small Intestine.—A Peyer's patch one foot from the ileo-cœcal valve showed two minute ulcers with slightly thickened bases in which a few opaque whitish foci were seen; two inches further along there was a similar ulcer; there was also one quite near the ileo-cœcal valve; the latter showed more advanced caseation than any of the former three.

Large Intestine.—Normal.

Mesenteric Glands.—The glands in the posterior part of the mesentery were enlarged indurated and showed on section caseous nodules irregular in outline ranging from a mere point up to 3 and 4 mm. in diameter. Two glands in the anterior part of the mesentery were slightly enlarged and showed caseous foci.

Ileo-Colic Glands.—One on each side of the junction of the ileum and cæcum was enlarged to two or three times the normal size and hardened; on section one showed in the centre a large caseous mass, replacing about three-quarters of the substance, and around the periphery numerous caseous foci; the other gland contained numerous caseous foci.

Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Showed in the substance just under the capsule a pinhead-sized grey translucent tubercle.

Kidneys, Lungs and Bronchial Glands.—Normal.

Smear Preparations.

Intestine (ulcer).—One tubercle bacillus.

Mesenteric Gland (Emulsion), } Numerous tubercle
Liver Tubercle. } bacilli.

A guinea-pig inoculated with an emulsion made from a mesenteric gland died tuberculous.

KITTEN 8.

Age—2½ weeks.

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of Milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 24th, 1904.

Duration of Experiment—131 days.

Tuberculin Test.

November 18th. 125 days after feeding.—Negative. Dose of tuberculin 2·0 cc.

POST-MORTEM EXAMINATION.

Body.—In good condition. Very fat.

Tonsils, Larynx, Pharynx, Tongue, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach, Small Intestine, Cœcum, Colon.—Normal.

Mesenteric Glands.—Normal in size and appearance.

Ileo-Colic Glands.—One ileo-colic gland showed in the centre an irregular hard opaque yellow nodule, the size of a wheat grain; it easily shelled out from the gland tissue and when crushed between glass plates was found to be distinctly gritty from calcification. A cover glass preparation showed numerous tubercle bacilli, singly and in clumps; they were fairly long, the majority being beaded.

A second ileo-colic gland and all the colic glands were normal.

Liver, Spleen, Kidneys, Suprarenal Bodies.—
—Normal.

Thorax :

Heart, Pericardium, Pleura, Lungs, Thoracic Glands.—Normal.

Various Lymphatic Glands :

Portal, Iliac, Lumbar.—Normal.

CAT 4. (Adult.)

Fed—Once with tuberculous milk of Cow 164.

Date—July 16th, 1904.

Amount of milk—23·8 cc.

Number of tubercle bacilli—1,000,000.

Killed—November 23rd, 1904.

Duration of Experiment—130 days.

Tuberculin Test.

November 18th, 1904. 125 days after feeding.—Positive. Rise of temperature 1·1° C. Dose of tuberculin 4·0 cc.

POST-MORTEM EXAMINATION.

Condition.—Fair.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Large Intestine, Small Intestine, Mesenteric Glands, Colic Glands.—Normal.

Liver.—Showed some fatty foci, but no tubercles.

Portal Gland, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Heart, Pleura.—Normal.

Lungs.—On the dorsal surface of the right caudal lobe there was a thin-walled nodule, about 5 mm. in diameter, containing soft cheesy white caseous material, appreciably gritty from calcification; the lung tissue surrounding the nodule was puckered, fibrous septa radiating outwards over the surface. Embedded in the septa were some scattered yellow nodules, the largest the size of a barley grain; these on section were cheesy and very gritty. In other parts of the lobe there were two translucent nodules about 3 mm. in diameter.

In the left caudal lobe there was a hard caseous and gritty tubercle, the size of a No. 4 shot. The left cephalic lobe contained a small translucent tubercle.

Bronchial Glands. — Darkly pigmented; no tuberculosis.

Microscopical Examination.

A smear made from the contents of the large nodule and from a small nodule showed numerous tubercle bacilli.

CAT 20. (Kitten.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—January 7th, 1905.

Duration of Experiment—137 days.

Tuberculin Test.

December 16th, 1904. 115 days after feeding.—Negative. Dose of tuberculin 1·0 cc.

POST-MORTEM EXAMINATION.

Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands.—Normal in size. The terminal mesenteric gland showed in the cortex an irregular chalky white mass of friable caseated tissue, very gritty from calcification; the rest were normal on section.

Ileo-Colic Glands, Colic Glands.—Normal.

Between the layers of the mesentery and mesocolon there were numerous transparent oval bodies, similar to those described in Cat 14.

Spleen, Liver, Portal Gland, Kidneys, Suprarenal Bodies, Lungs, Bronchial Glands, Heart, Prescapular Gland.—Normal.

Microscopical Examination.

Mesenteric Gland.—Moderate number of tubercle bacilli present.

CAT 14 (Adult.)

Fed—Once with an emulsion made from the tuberculous organs of Guinea-pigs 1148 and 1150, inoculated with milk of Cow 164.

Date—August 23rd, 1904.

Amount of Emulsion—0·5 cc.

Number of tubercle bacilli—10·15 million.

Killed—January 7th, 1905.

Duration of Experiment—137 days.

Tuberculin Test.

December 16th, 1904. 115 days after feeding. Negative. Dose of tuberculin 2·0 cc.

POST-MORTEM EXAMINATION.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Pharyngeal Glands.—Normal.

Abdomen :

Omentum, Peritoneum, Stomach.—Normal.

Small Intestine.—Showed no sign of ulceration. Under the mucous membrane there was a yellow spot, but no tubercle bacilli were found in it. The intestine contains numerous slender tæniæ.

Large Intestine.—Normal.

Mesenteric Glands.—Were normal in size ; on section those in the posterior part showed altogether about eight opaque yellow foci, the size of pins' heads.

Ileo-Colic Glands, Colic Glands.—Normal.

Between the layers of the mesentery and meso-colon there were numerous transparent oval seed-like bodies, each of which showed a whitish line running through its middle from pole to pole ; they measured a little over 1 mm. in length and were arranged on each side of the large lymphatic trunks ; when dissected from the mesentery each body was seen to be attached at one pole to a minute lymphatic branch.

Spleen, Liver, Portal Gland, Kidneys, Suprarenal Bodies.—Normal.

Thorax :

Lungs, Bronchial Glands, Heart.—Normal.

Microscopical Examination.

Two of the foci in the mesenteric glands were examined, and were found to contain numerous tubercle bacilli, many very beaded.

Intestine.—No tubercle bacilli.

CAT 12. (Kitten.)

Fed—With an emulsion made from the tuberculous organs of Guinea-pig 1082, inoculated with milk of Cow 164.

Date—July 25th, 1904.

Amount of Emulsion—12 cc.

Number of tubercle bacilli—Not estimated.

Killed—July 25th, 1904.

Duration of Experiment—221 days.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Submaxillary, Retro-Pharyngeal and Cervical Lymphatic Glands.—Normal.

Intestines, Large and Small.—Normal.

Mesenteric Glands.—Four mesenteric glands were slightly enlarged ; each showed in the cortex several opaque white caseous areas, the largest the size of a wheat grain ; some of these were highly calcareous, others only slightly.

The Ileo-Colic Glands contained similar nodules.

Lungs.—The ventral tips of the small middle lobes were red and consolidated ; in the caudal lobes just under the pleura there were seen several pin-head sized translucent tubercles ; they were just perceptible to the touch and were free from central caseation ; cephalic lobes normal.

Bronchial Glands, Spleen, Liver, Portal Gland, Kidneys, Suprarenal Bodies, Peripheral Lymphatic Glands.—Normal.

Microscopical Examination (Smear Preparation).

Ileo-Colic Gland.—Numerous tubercle bacilli.

Lung Tubercle.—No tubercle bacilli.

CAT 10. (Young Adult.)

Fed—With an emulsion made from the tuberculous organs of Guinea-pig 1082, inoculated with milk of Cow 164.

Date—July 25th, 1904.

Amount of Emulsion—12 cc.

Number of tubercle bacilli—Not estimated.

Killed—March 2nd, 1904.

Duration of Experiment—220 days.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

The Left Retro-Pharyngeal Gland was slightly enlarged and showed at one extremity three hard irregular chalky bodies each a little less than a millet-seed in size.

The Right Pharyngeal Gland contained a few gritty particles.

Stomach, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands.—One about the middle of the mesentery showed three or four hard yellowish tubercles, the largest about 1·5 mm. in diameter; a gland in the posterior part of the mesentery contained two calcareous particles.

Ileo-Colic and Colic Glands.—Normal.

Lungs, Bronchial Glands, Spleen, Liver, Portal Gland, Kidneys, Suprarenal Bodies.—Normal.

Microscopical Examination (Smear Preparation).

Left Pharyngeal Gland.—A few tubercle bacilli.

ABSTRACT OF POST-MORTEM NOTES OF EIGHT RHESUS MONKEYS.

FED WITH THE TUBERCULOUS MILK OF COW 164.

Animal.	No.	Age.	Date of Feeding.	Number of bacilli.	Bacilli contained in.	Duration of Experiment.	Tuberculin Test. After Experiment.	RESULT.
Monkey -	94	Baby -	26, vii., 1904	100,000	2·8 c.c. milk	42 days (killed).	1, ix., 1904 Negative.	All organs and glands were free from tuberculosis. The lungs contained 2 or 3 emphysematous bullae, in which the *Pneumonyssus griffithi* was found.
Monkey -	92	Adult -	26, vii., 1904	100,000	2·8 c.c. milk	42 days (killed).	1, ix., 1904 Negative.	No tuberculosis. There were several parasitic cysts in the lung, some of which were the size of a pea.
Monkey -	96	Baby -	26, vii., 1904	1,000,000	28 c.c. milk	42 days (killed).	1, ix., 1904 Negative.	All organs and glands perfectly healthy.
Monkey -	102	Adult -	26, vii., 1904	1,000,000	28 c.c. milk	42 days (killed)	1, ix., 1904 Negative.	No tuberculosis. The lungs showed numerous parasitic cysts. all of which contained the *Pneumonyssus griffithi.*
Monkey -	100	Baby -	26, vii., 1904	100,000	2·8 c.c.	125 days (killed).	18, xi , 1904 Negative. Rise of temperature, 0·3° C.	The liver showed on the surface, just under the capsule, seven spherical yellow softened nodules. each about 2 mm. in diameter ; in the depth of the liver substance there were two similar nodules. A smear made from one of the nodules showed no tubercle bacilli, but a few diplo-bacilli stained blue. Other organs and all lymphatic glands were normal. A guinea-pig, inoculated with an emulsion made from three of the nodules, died in 44 days of general tuberculosis.
Monkey -	90	Adult -	26, vii., 1904	100,000	2·8 c.c.	128 days (killed).	18, xi., 1904 Negative.	There were a few parasitic cysts in the omentum, and numerous cysts containing the *Pneumonyssus griffithi* in the lungs. Otherwise all organs and glands were normal.
Monkey -	98	Baby -	26, vii., 1904	1,000,000	28·2 c.c.	128 days (killed).	18. xi., 1904 Negative.	All organs and glands perfectly healthy.
Monkey -	88	Adult -	26, vii., 1904	1,000,000	28·2 c.c.	128 days (killed).	18, xi., 1904 Negative.	On the surfaces of both lungs there were several slightly raised greyish or greyish yellow areas, varying in diameter from about 2 to 5 mm., which were felt between the finger and thumb as slight thickenings. On section they were thin-walled air-containing cysts, with smooth internal walls covered with a slight amount of silvery grey deposit ; in this deposit a varying number of the *Pneumonyssus griffithi* was found, some cavities containing only one, others half-a-dozen ; the larger cavities were crossed by slender trabeculæ, and all were in communication with fine bronchioles. There was no sign of tuberculosis in any of the organs or glands.

ABSTRACTS OF THE POST-MORTEM NOTES OF SEVENTEEN GUINEA-PIGS.

TEN OF WHICH WERE FED WITH MILK OF COW 164 AND SEVEN WITH AN EMULSION MADE FROM THE TUBERCULOUS ORGANS OF GUINEA-PIGS 1148 AND 1150 INOCULATED WITH MILK OF COW 164.

No. of Guinea Pig.	Initial Weight in Grammes.	Date of Feeding.	Number of Tubercle Bacili.	Bacilli contained in.	Method of Administration.	Duration of Experiment.	RESULT.
1,152	160	27, vii., 1904	10,000	0·25 c.c. milk	Milk mixed with ordinary food	41 days (died)	No Tuberculosis.
1,153	950	27, vii., 1904	10,000	0.25 c.c. milk	Milk mixed with ordinary food	42 days (killed)	No Tuberculosis.
1,103	240	14, vii., 1904	100,000	1·36 c.c. milk	Milk mixed with ordinary food	41 days (killed)	No Tuberculosis.
1,102	1,100	14, vii., 1904	100,000	1.36 c.c. milk	Milk mixed with ordinary food	41 days (killed)	No Tuberculosis.
1,182	200	24, viii, 1904	1,000,000	0·05 c.c. E. of guinea-pig organs	Fed with pipette	43 days (killed)	No Tuberculosis.
1,108	1,050	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	9 days (killed)	No Tuberculosis.
1,121	870	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	42 days (died)	No Tuberculosis.
1,179	200	24, viii, 1904	10,150,000	0·5 c.c. E. of G.P. organs	Fed with pipette	42 days (killed)	No Tuberculosis.
1,180	940	24, viii, 1904	10,150,000	0·5 c.c. E. of G.P. organs	Fed with pipette	42 days (killed)	The left submental and the left submaxillary gland were enlarged and caseous throughout. The left cervical gland contained a caseating nodule. Intestines and mesenteric glands, normal. Lungs, normal. Spleen, normal. The liver showed some irregular yellow patches, not tuberculous. The portal gland contained a small caseous nodule; the left bronchial a caseous focus. Microscopical: T.B. in cervical and bronchial glands.
1,105	180	14, vii., 1904	10,000	0·136 c.c. milk	Mixed with ordinary food	96 days (killed)	No Tuberculosis.
1,104	730	14, vii., 1904	10,000	0·136 c.c. milk	Mixed with ordinary food	93 days (died)	No Tuberculosis.
1,154	160	27, vii., 1904	100,000	2·8 c.c. milk	Fed with pipette	55 days (died)	Under the mucous membrane of the lower end of the ileum there was a yellow spot (T.B. found). The submaxillary and the left submental glands and the portal gland were enlarged and practically caseous throughout; the right cervical was partly caseous; the left showed a caseating nodule. Mesenteric glands, normal. Spleen enlarged and beset with caseating tubercles, mostly arranged in groups. Liver contained numerous bile-stained patches of necrosis. The lungs showed a moderate number of caseous tubercles: the right anterior lobes were dark red and consolidated. The bronchial glands were enlarged and showed caseous patches, 3 to 5 mm. in diameter. There was a caseous nodule in one inguinal gland. Microscopical: T.B. numerous in a bronchial gland, the left inguinal gland, ileum and an ileo-colic gland.

ABSTRACTS OF THE POST-MORTEM NOTES OF SEVENTEEN GUINEA-PIGS—*continued.*

No. of Guinea Pig.	Initial Weight in Grammes.	Date of Feeding.	Number of Tubercle Bacilli.	Bacilli contained in.	Method of Administration.	Duration of Experiment.	RESULT.
1,155	790	27, vii., 1904	100,000	2·5 c.c. milk	Fed with pipette	55 days (killed)	No Tuberculosis.
1,183	120	24, viii., 1904	1,000,000	0·05 c.c. E. of G.P. organs	Fed with pipette	141 days (killed)	No Tuberculosis.
1,181	820	24, viii., 1904	1,000,000	0·5 c.c. E. of G.P. organs	Fed with pipette	141 days (killed)	No Tuberculosis.
1,174	200	24, viii., 1904	10,150,000	0·5 c.c. E. of G.P. organs	Fed with pipette	71 days (died)	Right submental and right submaxillary glands caseous throughout. Intestines and mesenteric glands, normal. Spleen: twice the normal size, beset with grey tubercles, some opaque in the centre. Liver showed numerous irregular canary yellow patches of necrosis. The lungs were beset with caseous tubercles; the right cephalic lobe was entirely solid, dense and caseous throughout. The bronchial and mediastinal glands were very large and caseous throughout; also the left inguinal. The right inguinal, coeliac and lumbar glands showed caseating nodules. Microscopical: T.B. numerous in a lung tubercle and in a submental gland.
1,173	1,000	24, viii., 1904	10,150,000	0·5 c.c. E. of G.P. organs	Fed with Pipette	59 days (died)	Left submaxillary gland caseous throughout and softened; right submaxillary studded with caseous foci. The cervical glands were partly caseous. The peritoneal sac contained a considerable amount of gelatinous serous fluid. The intestines and mesenteric glands were normal. Spleen enlarged and studded with caseating nodules up to the size of a pea; the larger ones were lobular in outline. The liver was pale and showed a number of large irregular necrotic patches and small opaque yellow foci. The portal gland was very large and caseous throughout. The lungs contained two pinhead sized tubercles. The coeliac and bronchial glands showed yellow caseous areas. Microscopical: T.B. were found in the spleen, the portal and a bronchial gland.

GUINEA-PIGS FED FOR SEVERAL DAYS WITH MILK OF COW 172.

No. of uinea-Pig.	Initial Weight in Grammes.	Final Weight in Grammes.	Duration of Feeding.	Duration of Experiment.	Killed or Died.	Result.
1,133	680	560	31 days	42 days	Killed	No sign of tuberculosis.
1,137	820	620	31 days	42 days	Killed	No tuberculosis.
1,134	700	570	31 days	70 days	Killed	A Peyer's patch 12 in. from the pylorus showed an opaque white spot; a similar point was seen in the mucous membrane of the colon. (No T.B. in either.) Four mesenteric glands were enlarged; two were caseous throughout; two showed caseous nodules. Left submaxillary, ileo-colic and portal glands were caseous throughout. Left submental and right cervical showed caseous and softened nodules. Two colic glands and the left cervical contained small caseous foci. The spleen was enlarged and showed from six to eight translucent nodules, caseous in the centre, the largest 3 mm. in diameter. In the liver there were yellow foci sparsely scattered throughout the substance. The lungs contained three grey tubercles. The bronchial glands were enlarged and partly caseous. Microscopical: T.B. in spleen, liver, lung, submental and mesenteric glands.
1,138	660	470	31 days	70 days	Killed	Intestines normal. Cervical and two left submaxillary glands enlarged and caseous. Two mesenteric glands in the posterior part of the mesentery were enlarged and showed small caseous nodules. Four ileo-colic glands were enlarged and caseous. Spleen, slightly enlarged, contained nine caseating nodules, 1 to 2·5 mm. in diameter. The liver showed scattered yellow foci. The portal gland was enlarged and caseous in half its extent. The right bronchial gland was enlarged indurated and showed a caseous patch in the centre. Lungs were normal. Microscopical: T.B. in submaxillary gland, ileo colic gland, and (?) in liver.
1,136	620	440	31 days	146 days	Died.	Stomach and intestines congested, otherwise normal. Pharynx normal. Submental and submaxillary glands partly caseous and softened. Cervical glands greatly enlarged caseous throughout and softened. Mesenteric glands normal. Spleen, enlarged, showed several irregular yellow patches, in the centres of which were cavities filled with brownish ill-formed pus. The liver contained irregular bile-stained necrotic patches, some softened in the centre. The portal gland was a large cyst filled with brownish-yellow pus. The coeliac, bronchial and ventral mediastinal glands were indurated and caseating. The lungs showed scattered nodules ranging in size from that of a shot to that of a small pea; on section the nodules were caseous and softened in the centre, some of the larger ones being empty cavities. Microscopical: T.B. in lung nodule.
1,140	320	380	31 days	147 days	Killed very ill	Between the chin and the sternum there was a series of twelve glands, varying in size from a large pea to a thrush's egg: all were caseous throughout and softened. Peritoneal sac contained several cubic centimetres of blood-stained fluid. The omentum was drawn up and studded with pin-head sized tubercles. Small intestine normal. A lymphoid patch in the cæcum was enlarged caseous and ulcerated; a second one showed a caseous focus. One mesenteric gland was caseous throughout; two others showed caseous foci. Duodenal, ileo-colic, pyloric, lumbar, ventral mediastinal, left axillary and right inguinal were enlarged and almost entirely caseous. The portal, bronchial and right axillary glands were caseous throughout. Spleen, greatly enlarged, contained large irregular necrotic patches and small isolated nodules, some distinctly gritty. Liver, large pale and fibroid, showed numerous irregular bile-stained necrotic patches. Lungs crowded with caseating tubercles, 1 to 2 mm. in diameter; right caudal lobe adherent to a thickened patch on the pleura. The right kidney showed two shot-sized tubercles; the parietal pleura, three. Microscopical: T.B. in cæcum and kidney.
1,135	770	—	31 days	166 days	Killed	No tuberculosis.

GUINEA-PIGS FED FOR SEVERAL DAYS WITH MILK OF COW 172—*continued.*

No. of Guinea-Pig.	Initial Weight in Grammes.	Final Weight in Grammes.	Duration of Feeding.	Duration of Experiment.	Killed or Died.	RESULT.
1,139	750	450	31 days	165 days	Died	The mucous membrane of the small intestine in the anterior part showed an ulcerated caseous nodule 6 mm. in diameter; two Peyer's patches near this showed minute whitish foci. Two lymphoid patches in the coecum were enlarged caseous and ulcerated on the mucous surface; there was an ulcerated caseous nodule in the first part of the colon. The peritoneal cavity contained a small quantity of slightly opalescent fluid. The mesenteric glands were hugely enlarged and fused together; they consisted of translucent fibroid tissue and irregular caseated patches and foci, some of which were softened. The submental, cervical, duodenal, pyloric, ileo-colic, portal, coeliac and several of the colic glands were similarly affected. Omentum retracted and crowded with discrete millet seed sized opaque tubercles. The lacteal vessels were greatly distended tortuous and showed here and there along their course opaque yellow tubercles. Spleen, greatly enlarged, contained numerous groups of grey tubercles, many opaque in the centre. The liver showed scattered necrotic foci and one or two canary yellow patches; one lobule was atrophied pale and fibroid. The lungs were beset with translucent tubercles, 2 to 3 mm. in diameter. Bronchial, ventral mediastinal, and lumbar glands were enlarged indurated and partly caseated. Microscopical: T.B. in an intestinal nodule.

GUINEA-PIGS FED FOR SIX DAYS WITH MILK OF COW 164.

Guinea-Pig.	Initial weight in Grammes.	Final Weight in Grammes.	Duration of Feeding.	Duration of Experiment.	Killed or Died.	RESULT.
157	260	370	6 days	70 days	Killed	The small intestine showed seven flattened ulcerated caseous nodules, ranging from 2 to 10 mm in diameter ; they were largest and most numerous in the ileum. Three lymphoid patches in the coecum showed caseous foci, and in the first part of the colon there were numerous caseous nodules over which the mucous membrane was ulcerated. The mesenteric glands were fused together into a mass $1\frac{1}{4} \times \frac{3}{4} \times \frac{1}{3}$ and were dense and caseous throughout ; the ileo-colic, colic, duodenal, portal, coeliac, left submental and left bronchial were caseous throughout and softening. The spleen contained four caseating nodules ; the liver numerous irregular yellow necrotic patches and foci. The left anterior lobe of the lungs contained a hard caseous nodule, the size of a pea, and a small translucent tubercle : in the right caudal lobe there was one tubercle. Right bronchial contained a small caseous nodule. Right inguinal, enlarged and caseating. Microscopical : T.B. in right inguinal, ileo-colic gland, colon and lung.
58	220	170	6 days	84 days	Died	Small intestines contained seven ulcerated caseous nodules 2 to 5 mm. in diameter ; one Peyer's patch in the small intestine and all the lymphoid patches in the coecum showed caseous foci ; in the upper part of the colon there were numerous small ulcerated caseous nodules and one large ulcer, 1 cm. in diameter. Mesenteric glands greatly enlarged, fused together and caseous throughout. The ileo colic, portal, coeliac, sternal and left submental were caseous throughout. Right submaxillary, cervical, iliac, lumbar and bronchial partly caseous. The liver and spleen were extensively tuberculous. The lungs contained about a dozen caseating tubercles, 1 to 3 mm. in diameter. There were a few small tubercles in the omentum and several on the mesentery. Microscopical.—T.B. in cervical and bronchial glands.
156	350	370	6 days	102 days	Died	Pharynx normal. One Peyer's patch in the duodenum showed a yellow focus and two lymphoid patches in the coecum were thickened, one being yellow and caseous. Mesenteric, ileo-colic and several of the colic glands were large, caseous and softened. Left submental, submaxillary, cervical, bronchial and portal glands were caseous throughout, the latter showing calcareous grains in the cortex ; the axillary and ventral mediastinal glands were fibroid and extensively caseated. The spleen showed caseating tubercles and a large patch of necrosis ; the liver was large pale and fibroid and showed bile stained necrotic patches. The left kidney contained a minute opaque tubercle. Lungs contained numerous tubercles mostly the size of pin's heads ; in the right lung there were two large caseous nodules. Microscopical : Numerous T.B. in coecum and lung.

ABSTRACTS OF THE POST-MORTEM NOTES OF THIRTEEN RABBITS FED WITH MILK OF COW 164.

No. of Rabbit.	Initial Weight in Grammes.	Date of Feeding.	Number of Bacilli.	Bacilli contained in.	Method of Administration.	Duration of Experiment	Killed or Died.	RESULT.
77	260	14, vii., 1904	10,000	0·136 c.c. milk	With pipette	44 days	Killed	Intestines and mesenteric glands normal. Right caudal lobe consolidated and caseating almost throughout; in the anterior lobes there were numerous caseating miliary tubercles. The left caudal lobe contained several caseating masses, but was not so severely affected as the right; in the left cephalic lobe there were a few grey miliary tubercles. The right bronchial gland was enlarged and showed small caseous nodules; the left caseous foci. Both kidneys contained numerous grey miliary tubercles, a few of which were slightly opaque. In the liver were numerous psorosperm nodules. Microscopical: T.B. in the lungs
71	3,160	14, vii., 1904	10,000	0·136 c.c. milk	With pipette	44 days	Killed	Intestines and mesenteric glands normal. The left lung contained half-a-dozen firm irregular caseous nodules, 4 to 10 mm. in diameter. The left bronchial gland was enlarged indurated and showed three caseating nodules. One kidney showed a grey translucent tubercle. The liver contained numerous psorosperm nodules. Microscopical: T.B. in lung; none in liver or kidney.
93	440	27, vii., 1904	100,000	2·5 c.c. milk	With stomach tube	42 days	Killed	No tuberculosis.
75	260	14, vii., 1904	100,000	1·36 c.c. milk	Mixed with ordinary food	44 days	Killed	No tuberculosis.
69	2,160	14, vii., 1904	100,000	1·36 c.c. milk	Mixed with ordinary food	44 days	Killed	No tuberculosis.
73	250	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	43 days	Killed	No tuberculosis.
67	1,310	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	43 days	Killed	Two soft caseous foci beneath the mucous membrane of the upper part of the small intestine (T.B. found in both). Mesenteric glands, a little enlarged, were studded with caseous foci. No tuberculosis elsewhere. Two psorosperm nodules on surface of liver.
94	500	27, vii., 1904	10,000	0·3 c.c.	With pipette	128 days	Killed	No tuberculosis.
72	3,060	14, vii., 1904	10,000	0·136 c.c.	With pipette	128 days	Killed	No tuberculosis.
76	260	14, vii., 1904	100,000	1·36 c.c.	Mixed with ordinary food	54 days	Killed	The mucous membrane of the small intestine showed several white patches similar to those seen in Goat 16. The mesenteric glands were oedematous, but there was no sign of tubercle. Coccidiosis of liver.
70	1,080	14, vii., 1904	100,000	1·36 c c.	Mixed with ordinary food	54 days	Killed	No tuberculosis.
74	280	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	128 days	Killed	No tuberculosis.
68	2,260	14, vii., 1904	1,000,000	13·6 c.c. milk	Mixed with ordinary food	128 days	Killed	No tuberculosis.

RABBITS FED FOR 31 DAYS WITH MILK OF COW 172.

Number of Rabbit.	Initial Weight in grammes.	Final Weight in grammes.	Duration of Feeding.	Duration of Experiment.	Killed or Died.	Result.
89	400	1,470	31 days.	70 days.	Killed.	Cervical glands normal. Small intestine: A yellow spot was seen in a Peyer's patch 18 inches from the pylorus (No. T.B.). The lymphoid tissue at the dilated end of the ileum and that in the appendix showed caseous foci, the mucous membrane over some of which was ulcerated. In the wall of the coecum there was a group of six caseating nodules, ulcerated on the mucous surface. Two mesenteric glands in the posterior part of the mesentery were a little enlarged and showed fairly numerous patches and foci of caseation. The omentum showed numerous miliary tubercles. The liver showed several psorosperm nodules. In the left kidney there were three minute grey tubercles. The lungs showed sparsely scattered opaque miliary tubercles. The right bronchial gland and a peri-bronchial gland were enlarged and contained caseous nodules and foci. Left bronchial normal. Microscopical: T.B. in ileum, mesenteric gland and peri-bronchial gland.
91	1,300	1,720	31 days.	70 days.	Killed.	There were three caseous foci in the dilated end of the ileum. One mesenteric gland contained a minute yellow gritty focus. The liver showed numerous pearly white tubercles (? psorosperm) (No. T.B.). Both kidneys contained numerous nodules, 1 to 3 or 4 mm. in diameter; the larger ones extended into the cortex in a wedge-shaped manner and were caseous in the centre; the small ones were spherical and translucent or slightly opaque in the centre. Lungs: The ventral portions of the anterior lobes showed recent adhesions; both cephalic lobes were consolidated and entirely caseated; part of the left caudal lobe was in a similar condition, the rest of the lobe being studded with spherical opaque tubercles; the right middle and caudal lobes contained numerous miliary tubercles and a few large caseous nodules. Bronchial glands enlarged, showed irregular caseated patches. There were a few pearly tubercles in the omentum. Microscopical: T.B. in mesenteric gland, kidney, lung and ileum.
90	320	1,940	31 days.	111 days.	Killed.	No tuberculosis.
92	1,140	1,570	31 days.	111 days.	Killed.	Three Peyer's patches in the ileum showed ulcerated caseous nodules; the lymphoid tissue at the termination of the ileum was studded with caseous foci; the mucous membrane of the vermiform appendix showed an irregular caseous ulcer. The mesenteric glands were not enlarged; they showed about half a dozen caseating tubercles. There were three minute tubercles on the surface of the spleen and one in the substance; the liver showed a few small tubercles. Each kidney showed very numerous nodules in the cortex. The lungs were packed almost as closely as possible with confluent caseating nodules; the cephalic lobes sank in water. The thoracic glands were caseous throughout. Other lymphatic glands showed caseous tubercles. There was one tubercle in the omentum. Microscopical: T.B. in mesenteric gland, spleen, and liver, none in lower end of ileum.

RABBITS FED FOR SIX DAYS WITH MILK OF COW 164.

umber of abbit.	Initial Weight in grammes.	Final Weight in grammes.	Duration of Feeding.	Duration of Experiment.	Killed or Died.	RESULT.
97	610	—	6 days.	6 days.	Died.	No Tuberculosis.
95	720	1,350	6 days.	70 days.	Killed.	The left submaxillary gland showed more than half its cortex caseous. Two Peyer's patches were enlarged, extensively caseated and ulcerated; in the mucous membrane in their neighbourhood there were several small ulcerated nodules; two other Peyer's patches contained ulcerated nodules, in one there was a group of three. A lymphoid patch in the colon showed opaque foci; one of the sacculi of the large intestine showed a caseous ulcer 1 cm. in diameter; there were 2 or 3 caseous foci in the appendix. The mesenteric glands were enlarged indurated and showed caseous nodules; two or three colic glands were caseous throughout. The omentum was thickened along its free margin and was everywhere covered with pearly tubercles: there were a few tubercles on the small omentum, mesentery and serous surface of the large intestine. The spleen contained one yellow point; the liver one small tubercle. There were numerous grey miliary tubercles in each kidney. The lungs were packed with opaque miliary tubercles; the bronchial glands contained caseous foci; the tendon of the diaphragm was studded with miliary tubercles. Microscopical: T.B. in ileum, liver and lung.
96	720	1,170	6 days.	95 days.	Died.	Two Peyer's patches in the ileum were thickened caseous and irregularly ulcerated; one about the middle of the intestine was studded with pin-head sized tubercles. Large intestine normal. Two mesenteric glands contained caseating masses distinctly gritty around the margins. Spleen showed one translucent tubercle on the surface and three yellow tubercles in the pulp. There were a few (?) tubercles in the liver. Both kidneys contained numerous caseating nodules. Lungs were heavy and closely beset with caseating masses which practically entirely replaced the lung tissue. The bronchial and ventral mediastinal glands were enlarged caseous and gritty. There were a few tubercles on the pleura, meso-colon and omentum. The inguinal, axillary, left submaxillary, gastric, and portal glands contained small caseous nodules. Microscopical: T.B. in mesenteric gland, spleen and lung.

THIRD SERIES OF SPECIAL FEEDING EXPERIMENTS.

This series of animals was fed with culture derived from the original material of Virus B.IX.

The series comprises three rhesus monkeys, two mandrill baboons, two mangabey monkeys, two lemurs, two calves, two goats, five pigs, six dogs, five cats, four mongooses, five rabbits and twelve guinea-pigs.

The dose in each case was 1·0 mg. with the exception of one young pig and two guinea-pigs which were given 0·1 mg.

The animals were fed in batches since it was undesirable to feed the whole series in one day; the total age of the culture varied therefore in different cases (from the 15th to the 28th generation); the subculture used was, however, three weeks old in each case.

The monkeys and baboons were all young animals; the goats, pigs, dogs, and cats were composed of young and adult; the rest were adult animals.

The duration of the experiments varied from 28 to 121 days; in many of the species in which there were two animals of the same age one was killed a short time after feeding (about seven weeks) whilst the other was allowed to live a longer period.

MONKEYS.

The rhesus monkeys, mangabey monkeys, mandrill baboons and lemurs were fed with the object of ascertaining whether different species of monkeys varied in susceptibility.

One of the rhesus monkeys (No. 108) died in 33 days of ulcerative colitis. It showed some early lesions in the intestines, mesenteric, submaxillary and cervical glands, a small caseous nodule in the lung and a minute grey point in a bronchial gland.

Another rhesus monkey died in 64 days of general tuberculosis, the tonsils and intestines, the glands in connection with the alimentary tract, and all the organs being affected; the lungs contained a few miliary tubercles and there was no obvious disease in the bronchial glands.

The third rhesus was killed in a dying condition, 80 days after inoculation, and showed general tuberculosis of a more severe type than in the latter; the tonsils and neck gland were, however, not affected. In this case caseous nodules were found in the cortex of the brain; this is the only instance in animals that have been fed with tuberculous material in which there has been intercranial tuberculosis.

One mandrill was killed 49 days after feeding and showed tuberculosis of one tonsil, several submucous caseous nodules, some ulcerated, in the stomach, four tuberculous ulcers in the small intestine, enlargement caseation and softening of most of the lymphatic glands along the alimentary tract, two soft caseous nodules in the spleen, two or three minute foci on the surface of the liver, and a doubtful tubercle in one kidney and one caseous nodule in the lungs.

The other mandrill died of general tuberculosis in 73 days; both tonsils were caseous and there were seven ulcers in the small intestine; the pharyngeal, cervical and mesenteric glands were very large and extensively caseated; the spleen contained caseous nodules and small tubercles; there were miliary tubercles in the liver, kidneys and lungs; one lobe of the lung was in a condition of caseous pneumonia and another contained a cavity; the bronchial glands were enlarged and caseating.

One of the mangabeys was killed in 47 days and showed ulceration of the small intestine, caseation and softening of the mesenteric glands and of one colic gland, a yellow point in the spleen, several small tubercles in the liver, a grey point in one kidney, a large caseous nodule in the right upper lobe of the lung and enlargement and caseation of the right bronchial glands.

The other mangabey died in 84 days of tuberculosis generalised in all the organs and all the abdominal and thoracic lymphatic glands were enlarged and caseous; there were five ulcers in the small intestine, well-marked tuberculous lymphangitis of the mesentery and slight tuberculosis of the omentum and pleura.

One lemur was killed 46 days after feeding; the post-mortem examination showed sixteen ulcers in the small intestine and several punched out ulcers in the large intestine, enlargement and suppuration of the glands in the neck, the mesenteric, ileo-colic and colic glands, 24 to 30 yellow tubercles in the spleen, some minute greyish white tubercles in the liver, a few doubtful foci in the kidneys, four caseous nodules in the lungs and softened caseous nodules in the bronchial glands.

The other lemur died in 79 days; in the small intestine eight Peyer's patches contained discrete yellow tubercles without ulceration; the neck glands, the thoracic and abdominal lymphatic glands were caseous and softened; the lungs contained numerous nodules ranging from a millet seed to a pea; in the centre of the right middle lobe there was a mass of aggregated nodules, the rest of the lobe being collapsed and airless; there were numerous caseous nodules in the spleen, numerous minute grey foci in the liver and a few doubtful points in the kidneys.

The experiments with monkeys show that the different species are very susceptible to tuberculosis.

All the animals developed general tuberculosis which in those that were allowed to live beyond seven weeks led to the death of the animal in periods varying from 73 to 84 days.

There was no difference in the results sufficiently well marked to enable one to say definitely that any one of the species was more, or less, susceptible than any other.

CALVES.

Two calves were fed; one was killed 50 days after, the other 140 days after the experiment began.

The former showed a few yellow foci in the tonsils, slight tuberculosis of the pharyngeal, mesenteric and ileo-colic glands and two calcareous foci in a mediastinal gland.

In the latter the glands in the neck underwent great enlargement, and during life caused obstruction to respiration and deglutition. On post-mortem examination the animal was found to have general tuberculosis; the tonsils were enlarged and tuberculous; there were numerous large submucous caseating nodules in the stomach and extensive ulceration of the small intestine.

The pharyngeal, cervical, gastric, mesenteric, ileo-colic, and coeliac glands were enlarged, dense and caseo-calcareous and in some cases softened. The spleen contained two yellow calcareous tubercles, the liver half a dozen nodules up to a pea in size, and the kidney three grey tubercles. In the lungs were moderately numerous dark red angular patches ranging up to 5 millimetres or more in diameter; some of these contained caseous foci or small gritty tubercles; others were homogeneous; besides these there were three or four firm yellow caseous gritty nodules ranging in size from a pea to a French bean.

The bronchial and mediastinal glands were enlarged, dense, and caseating, and there was slight tuberculosis of the pleura and peritoneum.

The tuberculosis in the latter calf appeared to be slowly progressing.

PIGS.

Four pigs, two 14 weeks old, and two 2 years old, were fed with 1·0 mg. of culture each and one young pig (15 weeks) with 0·1 mg.

One of the young pigs and one of the old ones were killed 48 days after inoculation.

The young pig on post-mortem examination showed tuberculous lesions in the tonsils, intestines, submaxillary, mesenteric and colic glands and miliary tuberculosis of the lungs, spleen and liver.

In the corresponding adult pig there were some minute ulcers in the intestines, no disease in the neck glands, extensive tuberculosis of the mesenteric and ileo-colic glands, a few miliary tubercles in the liver and some doubtful tubercles in the lungs.

The other two pigs fed with 1 mg. were killed in 112 and 113 days respectively; on post-mortem examination the young pig, No. 116, showed general progressive tuberculosis; the adult pig was much less severely affected and the tuberculosis was in a retrogressive condition; of the internal organs only the liver contained a few tubercles.

The young pig, fed with 0·1 mg. was killed in 113 days; the post-mortem examination revealed general tuberculosis, if anything of a more severe type than in Pig 116; no lesions were found in the tonsils or intestines.

The experiments show that the adult pig is much more resistant to tuberculosis induced by feeding than is the young pig; in the latter the disease rapidly becomes generalised and is progressive in character; in the former the disease is more limited in its spread and tends to retrogress.

The smaller effect in the adult pig appears to be due to greater resistance of the tissues and not to lessened absorption of bacilli, for in both the adult pigs the lymphatic glands draining the alimentary canal were more extensively diseased than they were in the young pigs. It is also to be noted that the young pig fed with 0·1 mg. was more severely affected than either of the adult pigs fed with 1·0 mg.; this clearly indicates that the greater effect in the young animals fed with 1·0 mg. was due to greater susceptibility and not to relatively larger doses.

GOATS.

Two goats, one young and one adult, were fed, each with 1·0 mg. of culture, and killed 114 and 115 days later respectively. The adult goat was the mother of the young one. In neither was there any disturbance of health during the experiment.

On post-mortem examination the adult goat showed enlargement, caseation and softening of the submaxillary and retro-pharyngeal glands and of one cervical and one dorsal mediastinal gland, one tubercle in a mesenteric gland, three small tubercles in a duodenal gland, a few small caseous nodules in the parotid glands and an ileo-colic gland, and three small tubercles in a portal gland; there was no sign of tuberculosis in any of the organs.

In the young goat there were some shallow ulcers in the terminal part of the small intestine, discrete calcareo-caseous nodules in the submaxillary and retro-pharyngeal glands, and complete caseation of one small cervical gland; a precardiac gland, four mesenteric glands, two ileo-colic and one colic gland contained each one small tubercle. In the lung there was a large softened nodule, an emulsion from which rendered a guinea-pig tuberculous.

The disease in both goats was limited in extent and appeared to be arrested. Goats are apparently less susceptible than pigs to tuberculosis by feeding.

DOGS.

Six dogs, three young and three adult, were fed each with 1·0 mg. of culture.

One of the young animals was only two days old when the experiment began; it died of helminthiasis 71 days later, and only slight tuberculosis of the pharyngeal glands was found.

Another young dog, killed 49 days after feeding, showed tuberculosis of the tonsils and intestines, the pharyngeal, mesenteric, ileo-colic and bronchial glands, and two caseous tubercles in the lungs.

In the third young animal, killed 112 days after the experiment began, the tuberculosis was retrogressive and limited to the pharyngeal, mesenteric and ileo-colic glands.

Two of the adult animals, aged about one year, were killed in 49 and 110 days, and were found to be free from tuberculosis.

The third adult animal, No. 50, older than either of the last two, was killed after 111 days; on post-mortem examination one anterior lobe of the lung was partly consolidated and contained a small cavity, and there was no disease of the alimentary tract or glands in connection with it.

From the pus in the cavity and from the consolidated lung tissue a culture was isolated, in both cases through the guinea-pig, which differed in cultural characters and pathogenic effects from the bacillus experimentally introduced—differed in being more easy growing and less virulent.

The experiments show that the dog is with difficulty infected by feeding and that adult animals are more resistant than young ones. In only one of the puppies were lesions found in the internal organs and these were very limited in extent.

CATS.

Five cats, three young and two adult, were fed each with 1·0 mg. of culture. They were killed in periods varying from 47 to 121 days.

In the two adult cats the disease was limited to the mesenteric glands, and no lesions were found in the mucous membrane along the alimentary tract.

The three kittens were more severely affected. In one case there were minute ulcers in the small intestine, and in all three the pharyngeal mesenteric and ileo-colic glands were tuberculous.

The lungs were affected in every case; in two they contained miliary tubercles and there was no disease of the bronchial glands; in the third, killed 47 days after it was fed, one lobe contained a large caseous nodule and the adjacent bronchial glands were enlarged and caseous.

The spleen in one instance showed some doubtful areas, and in another the Malpighian bodies were enlarged (T.B. found).

These experiments show that kittens are more readily infected with tuberculosis by feeding than are cats, the infection spreading from the glands of the alimentary tract first to the lungs; in cats there is a greater tendency to limitation and arrest of the disease.

GUINEA-PIGS.

Twelve guinea-pigs were fed, two with 0·1 mg. and ten with 1·0 mg.

The two fed with 0·1 mg. were killed 49 and 121 days later respectively. The others died in periods varying from 28 to 64 days. Many of the latter died prematurely before the disease had time fully to develop.

All the guinea-pigs showed tuberculous lesions, generalised in all the organs except in two cases; in one of these the disease had not extended beyond the mesenteric glands; in the other a bronchial gland was affected as well as the intestines and mesenteric glands.

In ten of the animals there were lesions in the small intestines; in the other two no lesions were found.

The mesenteric glands were affected in every case, the ileo-colic in eight, the colic in two and the glands in the neck in seven.

RABBITS.

Six rabbits were fed each with 1·0 mg. of culture; one died in three days; the others were killed in periods varying from 48 to 121 days.

Of the latter, one was killed when ill, 81 days later, and was found to have general tuberculosis, the lungs being the most severely affected; two were killed in 48 and 55 days respectively and showed a moderate degree of tuberculosis; another killed 111 days after feeding was very slightly affected, one mesenteric gland containing a focus of caseo-pus and the lungs a few small tubercles only; the fifth rabbit, killed in 121 days, was perfectly healthy.

These results illustrate the irregular effect of inoculation by feeding, and show that with a given dose varying numbers of bacilli may be absorbed from the alimentary canal by different animals of the same species.

Infection by the alimentary tract appears to be effected with less certainty in rabbits than in guinea-pigs, probably because tubercle bacilli are absorbed, as a rule, less readily in the rabbit. It would be incorrect, however, to infer on this account that the rabbit is more resistant to tuberculosis than the guinea-pig, for, when inoculated into the tissues even in very small doses, bovine tubercle bacilli are capable of setting up general progressive tuberculosis equally in both species of animals.

MONGOOSES.

The four mongooses all died in periods varying from 21 to 59 days, three of hæmorrhage from gastric ulcers, the fourth from peritonitis following a perforated duodenal ulcer.

In two of the animals there was no sign of tuberculosis.

In a third, one submaxillary gland was caseous and there was no disease of the abdominal organs or lymphatic glands; the lungs contained one caseating nodule, and the bronchial glands on the same side were advanced in caseation.

The fourth mongoose showed tuberculosis of the submaxillary glands, one pharyngeal gland, the mesenteric glands, one ileo-colic gland, and the spleen, liver and lungs.

COURSE OF INFECTION.

The experiments show clearly that tubercle bacilli can pass through the mucous membrane of the alimentary tract without setting up tuberculosis at the site of entry. In twenty-three instances there were lesions in the glands of the neck, and no disease of the tonsils or pharyngeal mucous membrane, and in eleven instances the mesenteric glands were affected. and no lesions were found in the intestinal mucous membrane.

The occurrence of single caseous nodules, some of large size, in the lungs of the animals killed a short time after feeding, makes it reasonable to conclude that not all the bacilli which passed through the alimentary mucous membrane into the nearest lymphatic glands were detained there, but that some were carried onwards in the efferent lymph stream (or possibly by the blood stream) to be arrested in the lungs.

This direct infection of the lungs within a short period of the ingestion of tubercle bacilli has been demonstrated to take place in the case of puppies, and it is at least possible that the tuberculosis of the lungs in Dog 50 was produced in this way.

If this be the true explanation of the result in Dog 50, and the apparent age of the lesion was not inconsistent with it, it of necessity follows, since the bacillus recovered from the lung differs in its properties from that experimentally introduced, that the dog is able to modify the bovine tubercle bacillus.

The examination of animals a short time after the ingestion of tubercle bacilli has clearly shown that the bronchial glands generally become affected secondarily from the lungs ; in only two cases, Guinea-pigs 1562 and 1567, were the bronchial glands tuberculous without evident disease of the lungs.

			Sites of Entry.		Lymphatic Glands of the Alimentary Tract.														
					Neck Glands.			Nearest Abdominal Glands.									Serous Surfaces.		
Animal.	Dose.	Duration of Life.	Tonsils.	Intestines.	Submax.	Pharynx.	Cervical.	Mesenteric.	Ileo-colic.	Colic.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Gland.	Kidneys.	Pleura.	Peritoneum.	Various Lymphatic Glands.
Monkey 108 - -	1·0 mg.	33 days	—	+	+	—	+	+	—	—	+ (Slight)	+ Slight	—	—	—	—			
Monkey 106 - -	1·0 mg.	64 days	+	+	+	+	◆	◆	+	+	+ (Slight)	—	+	◆	—	+		+ Omentum	+
Monkey 110 - -	1·0 mg.	80 days	—	+	—	—	—	◆	◆	◆	◆	◆	+	+	+	◆	+	+ Omentum	+
Mangabey 2- - -	1·0 mg.	47 days	—	+	—	—	—	◆	—	+	+ (1 nodule)	◆	+	+	—	?			
Mangabey 4- - -	1·0 mg.	84 days	—	+	+	—	—	◆	+	+	◆	+	◆	◆	+	+	+ 1 Diaphragm	+ Omentum	+
Mandrill Baboon 54 -	1·0 mg.	49 days	◆	+ and stomach	—	◆	◆	◆	◆	+	+ (1 nodule)	—	+	? +		? (no T.B.)	—	—	—
Mandrill Baboon 56 -	1·0 mg.	73 days	◆	+	+	+	◆	◆	+	+	◆	◆	+	◆		+		+ Omentum	—
Lemur 2 - - -	1·0 mg.	46 days	+	◆	+	◆	◆	◆	◆	◆	+ (4 nodules)	+	+	+	+	? +	—	—	
Lemur 4 - - -	1·0 mg.	79 days (Died)	—	+	+		◆	◆		◆	◆	+		+	◆	? +	—	+ Omentum	+
Calf 382. 13 weeks -	1·0 mg.	50 days (killed)	+	—	—	+	—	+	+	—	—	— 1 mediastinal.	—	—	—	—	—	—	
Calf 380. 13 weeks -	1·0 mg.	140 days (killed)	◆	◆ and stomach.	+	◆	◆	◆ and gastric.	◆	+	+	◆ & mediastinal.	+		+	+	+	+	Cœliac
Goat 32 (young) - -	1·0 mg.	115 days	—	+	+	◆	+	+	+	+	+ (Slight)	—	—	—	—	—	—	—	—
Goat 30 (adult) - -	1·0 mg.	114 days	—	—	◆	◆	+	+	+	—	—	— 1 mediastinal affected.	—	—	+	—	—		
Pig 114. Age 14 weeks	1·0 mg.	48 days	+	+	◆	—	—	+	+	+	+	+	+	+	+	+	—	? Omentum	
Pig 118. 2 years - -	1·0 mg.	48 days	—	+	—	—	—	◆	+	+	? +	—	—	+	—	—	—	—	
Pig 116. 14 weeks -	1·0 mg.	112 days	—	+	◆	—	+	◆	◆	◆	◆	+	+	+	+	—	+ Diaphragm	+ Omentum	
Pig 120. 2 years - -	1·0 mg.	113 days	—	+	+	—	—	◆	◆	◆		—	—	+ (Slight)	+	—	—		
Pig 108. 15 weeks -	0·1 mg.	113 days	—		◆	+	—	+	+	+	◆	◆	+	◆	+	?	+ Diaphragm	+ Omentum Peritoneum	+
									Slight.										

Animal.	Dose.	Duration of Life.	Sites of Entry.		Lymphatic Glands of the Alimentary Tract.					Lungs	Bronchial Glands.	Spleen.	Liver.	Portal Gland.	Kidneys.	Serous Surfaces.	
			Tonsils.	Intestines.	Neck Glands. Submax.	Neck Glands. Pharyng.	Mesenteric.	Ileo-colic.	Colic.							Pleura.	Peritoneum.
Mongoose 8 - - -	1·0 mg.	36 days	No tuberculosis. Death from perforated duodenal ulcer.														
Mongoose 10 - - -	1·0 mg.	21 days	No tuberculosis. Death due to hæmorrhage from gastric ulcers.														
Mongoose 12 - - -	1·0 mg.	35 days	—	—	+	—	—	—	—	+	+	—	—	—	—	—	+ Omentum
Mongoose 14 - - -	1·0 mg.	59 days	—	—	+	+	+	+	—	+	—	+	+	—	—	—	
Dog 58 (pup) - - -	1·0 mg.	49 days	+	+	—	✦ (Left)	✦	+		+	+	—	—	—	—	—	—
Dog 62 (Age 1 year) -	1·0 mg.	49 days	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dog 52 (pup 2 days old) -	1·0 mg.	71 days	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—
Dog 50 (adult) - -	1·0 mg.	111 days	—	—	—	—	—	—	—	+	—	—	—	—	? +	—	—
Dog 60 (pup) - - -	1·0 mg.	112 days	—	—		+	+	+	—	—	—	—	—	—	—	—	—
Dog 64 (1 year) - -	1·0 mg.	110 days	—	—	—	—	—	—	—	? one tubercle. No T.B. found.	—	—	—	—	—	—	—
Cat 48 (kitten) - -	1·0 mg.	47 days	—	✦	—	+	✦	+	—	+	+	— T.B.	—	—	—	—	—
Cat 46 (adult) - - -	1·0 mg.	48 days	—	—	—	—	+	+	—	—	—	—	—	—	—	—	—
Cat 50 (kitten) - -	1·0 mg.	70 days	—	—	—	+	+	+	—	+	—	—	—	—	—	—	—
Cat 52 (kitten) - -	1·0 mg.	121 days	—	—	—	+	+	+	—	✦	?	+	—	—	—	—	—
Cat 38 (old) - - -	1·0 mg.	111 days	—	—	—	—	+	—	—	? No T.B.	—	—	—	—	—	—	—

Animal.	Dose.	Duration of Life.	Sites of Entry.		Lymphatic Glands of the Alimentary Tract.					Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Gland.	Kidneys.	Serous Surfaces.		Various Lymphatic Glands.
					Neck Glands.		Nearest Abdominal Glands.											
			Pharynx.	Intestines.	Submax.	Cervical.	Mesenteric.	Ileo colic.	Colic.							Pleura.	Peritoneum.	
Rabbit 303 - - -	1·0 mg.	48 days		+	+	+	+			+	+	+		?	+			
Rabbit 345 - - -	1·0 mg.	55 days		+			+			+	+		+					
Rabbit 304 - - -	1·0 mg.	81 days	+	+	◆	◆	◆			◆	◆	+	+		+	+		
Rabbit 302 - - -	1·0 mg.	111 days					+			+ (Slight)								
Rabbit 346 - - -	1·0 mg.	121 days	No tuberculosis.															
Guinea-pig 1621 - -	0·1 mg.	49 days		+	◆	+	◆			+ (1 tubercle)	◆	+	?					
Guinea-pig 1622 - -	0·1 mg.	121 days					+			+	◆	+		◆			+ Omentum	+
Guinea-pig 1562 - -	1·0 mg.	28 days		+			◆	◆			+							
Guinea-pig 1564 - -	1·0 mg.	30 days		+			+											
Guinea-pig 1560 - -	1·0 mg.	38 days		+			+	◆			◆	+	?+	+				
Guinea-pig 1566 - -	1·0 mg.	38 days					+		+	+ (1 tubercle)		+	+ (Slight)	+				
Guinea-pig 1567 - -	1·0 mg.	42 days		+	◆	+	+	◆			◆	◆	+	◆				
Guinea-pig 1619 - -	1·0 mg.	42 days		+	+	+	+	+	+	◆	◆	◆	◆	◆				+
Guinea-pig 1563 - -	1·0 mg.	43 days		+		+	+	+		+		+	+	+				+
Guinea-pig 1565 - -	1·0 mg.	47 days		+	+	+	+	+		+		◆	◆	◆				+
Guinea-pig 1561 - -	1·0 mg.	52 days		+	◆	+	◆	◆		+ (2 tubercle)	◆	+	+					+
Guinea-pig 1620 - -	1·0 mg.	64 days		+	◆	+	◆	◆		◆	◆	◆	◆	◆				+

DETAILED DESCRIPTION OF EXPERIMENTS.

RHESUS MONKEY 108. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—June 2nd, 1905.

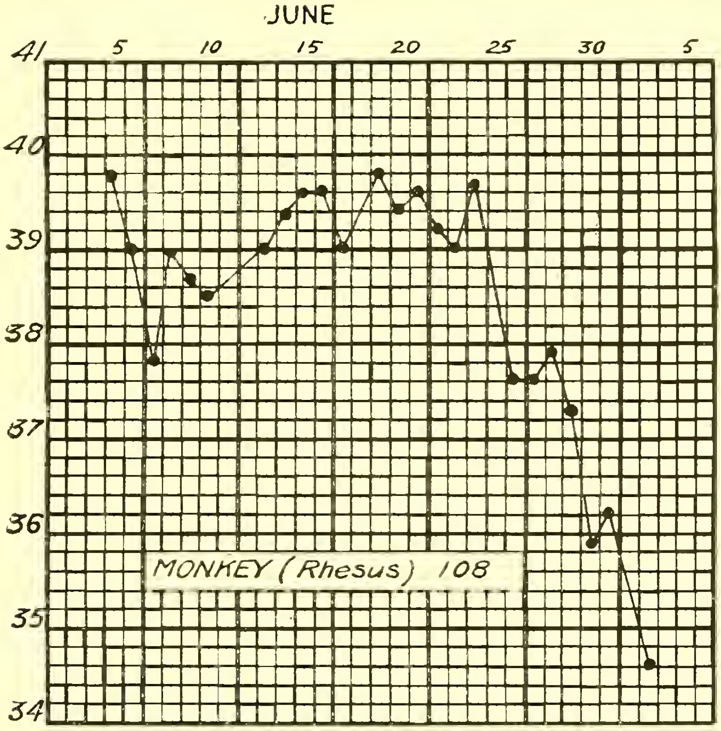
Killed.—In a dying condition on July 5th, 1905, 33 days after the experiment began.

Clinical History.

A fortnight after the experiment began diarrhœa set in, the motions being mixed with mucus (no T.B. found); the diarrhœa continued and the animal began to lose flesh and strength. On July 5th, 1905, he was found in a dying condition and was therefore chloroformed.

The post-mortem examination showed that the illness was due to ulcerative colitis.

Temperature.



POST-MORTEM EXAMINATION.

Tonsils, Tongue and Pharynx.—Normal.

Submaxillary Glands.—One of the right submaxillary glands showed a minute greyish white focus; the left was normal.

Retropharyngeal Glands.—Normal.

Cervical Glands.—One of the glands on the right side behind the clavicle contained a minute greyish white focus; other glands on the right side and all those on the left were normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—A Peyer's patch about the middle of the small intestine showed an opaque yellow focus measuring about 1·5 mm. in superficial area: this could just be felt between the finger and thumb: a few inches further along two similar but rather smaller foci were seen: one of these was situated in a Peyer's patch: the other under the mucous membrane; these foci were not ulcerated. A Peyer's patch about the beginning of the ileum showed three minute ulcers with slightly congested edges; the ulcers were situated in the centres of opaque yellow foci in the submucous lymphoid tissue, which did not measure more than 1 mm. in diameter. The rest of the small intestine was normal.

Large Intestine.—In the upper part on the summits of the valvulæ conniventes were several congested erosions; about the middle there was a length of intestine (2–3 inches) that was devoid of mucous membrane, except for a few small congested islands, being smooth and fibrous looking.

Gastric Glands.—Normal.

Mesenteric Glands.—Two in the middle of the mesentery not apparently enlarged had a patchy greyish white appearance in the cortex (? very early caseation); other glands were normal to the naked eye.

Colic Glands.—Enlarged and œdematous, otherwise normal.

Spleen
Liver
Kidneys } Normal.
Suprarenal Bodies

Portal, Iliac, Lumbar, Inguinal and Axillary Glands.—Normal.

Thorax:

Heart.—Normal.

Pleura.—Normal.

Lungs.—Expanded, pinkish and crepitant throughout; in the midst of the left caudal lobe there was a firm opaque-greyish white nodule 2 to 2·5 mm. in diameter.

The left praetracheo-bronchial gland showed a minute greyish focus; other bronchial glands were normal

Microscopical Examination.

Small Intestine.—Numerous T.B.
Mesenteric Gland.—Very numerous T.B.
Right Submaxillary }
Right Deep Cervical } Numerous T.B.
One of the Tonsils.—Four T.B.
Colic Gland.—No T.B.
Lung Nodule.—Extremely numerous T.B., many very beaded.
Left Bronchial.—Numerous T.B., some beaded.

RHESUS MONKEY 110. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—July 10th, 1905.

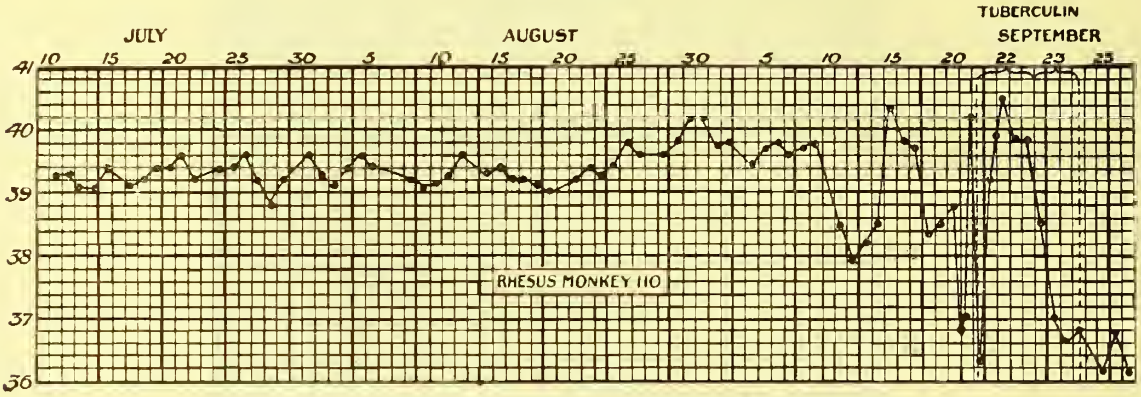
Killed.—In a dying condition, on September 28th, 1905, 80 days after the experiment began

Clinical History.

The monkey became ill towards the end of August; the first signs of illness noticed were "staring coat" and a subdued manner; he then gradually lost appetite and strength and during the last few weeks of life was very weak and emaciated.

Tuberculin Test.—September 22nd, 1905. Seventy-four days after the experiment began. Doubtful. Temperature high before the test.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin; and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Body.—Very emaciated.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxillary, Retro-Pharyngeal and Cervical Glands.—Normal.

Abdomen:

The Omentum showed two pin-head sized yellow tubercles.

Stomach.—The mucous membrane showed a small ulcer with raised margins and slightly thickened base which was not caseous.

Small Intestine.—The mucous membrane of the small intestine showed ten typical tuberculous ulcers, widely distributed, the first situated about 12 inches from the pylorus; the ulcers, with the exception of two near the ileo-coecal valve which were very small, were transverse and ranged in size from about 5 mm. in length up to 10 × 4 mm. in area; they had raised thickened margins, irregular caseo-necrotic floors, in one case hæmorrhagic, and thick caseous bases; the majority of the ulcers showed on the serous surface well-marked subperitoneal tubercles which in the case of one of the larger ulcers completely encircled the gut; in the latter case caseous tubercles were seen also between the mucous and muscular coats.

The mesentery attached to the upper part of the ileum, in which the larger ulcers were situated, showed some thickened nodular caseous lymphatic vessels extending a short distance from the bowel. In other parts of the mesentery were scattered caseous nodules (six counted), the largest 2 mm. in diameter.

In the large intestine were two small submucous caseous nodules with no ulceration.

Mesenteric Glands.—The mesenteric glands were greatly enlarged and fused together to form a nodular fluctuating mass, the size of a hen's egg; on section all the glands were filled with greenish-yellow caseo-pus; the capsules of some of the glands were very thin and in those lying on the external part of the mass appeared to consist of little more than peritoneum.

Ileo-colic Glands.—On one side of the junction of ileum and coecum there were four glands; two, about the size of peas, were caseous throughout; the two others contained each a pin-head sized caseous tubercle; on the opposite side one contained a small soft caseous nodule.

Colic Glands.—A mid-colic gland slightly enlarged showed firm caseous patches in the cortex; a gland a little further along, the size of a pea, was caseous throughout.

Rectal Glands.—Normal.

Spleen.—Little if at all enlarged, contained seven or eight soft yellow caseous nodules ranging in size from a small shot to that of a pea.

In the hilum of the spleen there was a yellow pea sized gland caseous and softened throughout.

Liver.—Normal in general appearance, showed on the surface under the capsule about two dozen tubercles ranging in size from 1 to about 2 mm. in diameter; the tubercles were opaque yellowish-white and caseous throughout; on section no tubercles were seen in the depth after many thin transverse sections.

In the hilum of the liver there was a small gland containing a soft caseous nodule.

The Left Kidney showed on the surface numerous opaque caseous tubercles, the largest about 1·5 mm. in diameter; several projected slightly above the surface and were adherent to the capsule; on section similar tubercles were seen in the depth.

The Right Kidney contained similar tubercles, majority rather larger; at one part several tubercles were grouped together in a large cluster.

The Right Suprarenal Body contained two spherical soft yellow caseous tubercles, the size of a shot.

Left Suprarenal Body.—Normal.

The Pancreas contained a pin-head sized caseous tubercle. Above the head of the pancreas between it and the vertebral column there was a group of enlarged glands the substance of which was extensively replaced by soft yellow caseous nodules.

One Lumbar Gland contained a soft caseous nodule ; the others were enlarged and congested but not caseous.

Iliac Glands.—A left iliac gland, the size of a small marble, was yellow caseous and softened throughout ; one of those on the right side contained a pin-head sized caseous tubercle.

A Left Inguinal Gland was enlarged and showed two or three soft caseous areas in the cortex.

Thorax :

Heart.—Normal.

The Parietal Pleura showed on the left side a pin-head sized caseous tubercle.

Diaphragm.—Normal

The Lungs were closely beset with discrete shotty tubercles, mostly about 1 mm. in diameter ; a few were slightly larger ; they were caseous and had congested grey margins ; in the right caudal lobe near the dorsal surface there was a firm caseous nodule 8 mm. in diameter, irregular in outline.

A Left Praetracheo-Bronchial Gland was enlarged congested, and œdematous ; it contained two caseous tubercles, each about 2 mm. in diameter.

A Left Intertracheo-Bronchial Gland was enlarged and congested and contained a small softened caseous nodule.

The Right Praetracheo-Bronchial Glands, two or three in number, were caseous throughout and softened and were fused together to form a mass the size of a swallow's egg.

A Right Intertracheo-Bronchial, the size of a thrush's egg, was also caseous and softened.

On the right side just within the entrance to the thorax there was an enlarged caseous and softened gland.

Brain.—The right occipital lobe showed on the surface four or five small irregular caseous patches ; these on section extended into the cortex and were firmer than the surrounding brain substance ; there was a smaller caseous nodule in the cortex of the right temporo-sphenoidal lobe.

RHESUS MONKEY 106. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—June 2nd, 1905.

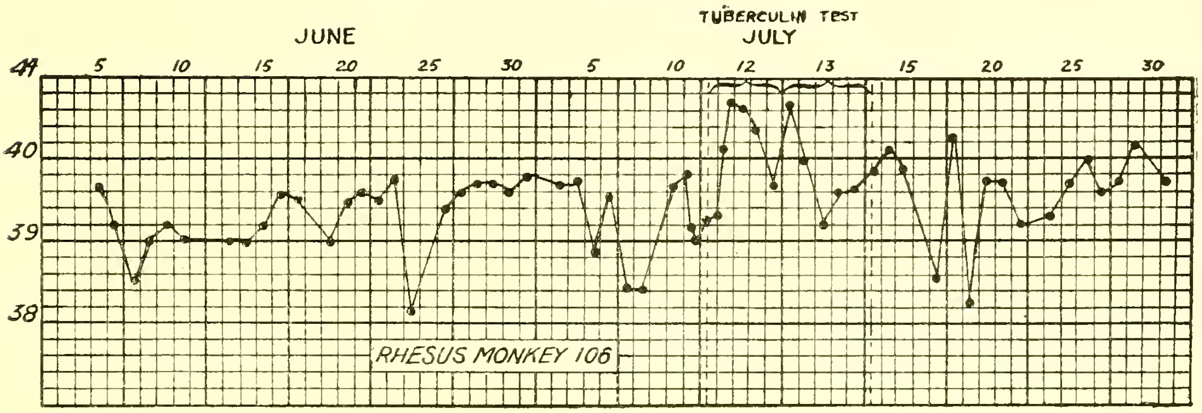
Died.—August 5th, 1905, 46 days after.

Clinical History.

The monkey became ill towards the end of July and then rapidly lost strength and flesh ; there was no diarrhœa and no increase in respiration.

Tuberculin Test.—July 12th, 1905. Forty days after the experiment began. Positive. Rise of temperature 1·4 C.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours ; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Tonsils.—In the tonsils on each side were yellow caseous foci.

Pharynx, Tongue, and Larynx.—Normal.

One Submaxillary Gland on the right side contained a softened yellow nodule.

Cervical Glands—On each side of the thyroid cartilage applied to the cervical vertebræ and reaching to the base of the skull was a chain of glands, 1 inch by $\frac{1}{3}$ inch on the left side, and on the right a little longer and a $\frac{1}{4}$ inch wide. They were yellow and softened throughout.

A small pea-sized gland in front of the junction of thyroid cartilage and hyoid bone was caseous and softened. A gland behind the right clavicle contained two small opaque foci.

The glands in the posterior triangle were normal.

Abdomen :

The Omentum contained fairly numerous opaque tubercles the size of millet seeds, softened in the centre.

Some small lymphatic glands in the omentum were normal.

Peritoneum.—On the pariental peritoneum on the left side there was a patch of organised lymph, firmly adherent ; on the same side near the spleen were about twelve grey tubercles (1·5 mm. in diameter) with opaque centres. There were three similar tubercles on the right parietal peritoneum near the pelvis.

Stomach.—Normal.

The Small Intestine contained eight ulcers ; three occurred in the duodenum close to the pylorus, one in the jejunum and the rest in the ileum not far distant from the colon. The ulcerated areas were very small but well defined. The largest was circular and had a diameter of 2 mm. The bases were thickened with small opaque tubercles under the peritoneum. One Peyer's patch near the colon was about 2 inches long, was firm and thickened, and contained numerous yellow tubercles, many of which were softened in the centre. A very small ulcer occurred in the centre of the patch.

Large Intestine.—In the cœcum there was an irregular deeply injected area 1½ inch by ¾ inch, with a layer of lymph over part of it, and some caseous thickening between the mucous membrane and the peritoneum. In the colon there was one ulcer 4 mm. in diameter with a caseous thickened base, four smaller ulcers, and several discrete yellow tubercles projecting under the mucous membrane.

Gastric Glands.—There was a gland situated at the pylorus rather larger than a pea, which contained two nodules filled with soft, yellowish pus.

The Mesenteric Glands were large and fused into two masses. The mass at the lower end measured 1½ inch by 1 inch by ½ inch. The upper group was made up of four glands, the largest being 1 inch by ½ inch. On section they were all tense cysts containing thick yellow caseo-pus.

Four of the numerous small glands arranged along the colon contained small greyish opaque foci.

Liver.—On the surface there could be seen beneath the capsule numerous tubercles, the smallest grey, the largest slightly yellow. They ranged in size from a pin-point up to 2 mm. in diameter and the largest were softened in the centre. On section the substance of the liver showed numerous grey tubercles, some exceedingly small and translucent, others larger with opaque centres.

The Portal Glands were normal.

Spleen.—On the external surface of the spleen there were some adherent fibrin. In the substance there was about 20 opaque tubercles, up to 2 mm. in diameter, which contained in the centres soft creamy pus.

One of three glands in the hilum of the spleen contained a small caseous focus.

Kidneys.—The left kidney contained one small grey tubercle with an opaque centre. In the right kidney there were five similar tubercles and one yellow miliary tubercle softened in the centre.

Thorax :

Left Lung.—The cephalic lobe was normal; the caudal lobe contained one grey translucent tubercle (about 1 mm.) slightly opaque in the centre.

Right Lung.—The cephalic lobe contained one similar tubercle, the middle lobe contained two opaque tubercles, 1·5 and 2·5 mm. in diameter. At the extremity of the caudal lobe were two opaque tubercles the size of small shot.

Bronchial Glands on both sides were normal.

Heart.—Normal.

Brain.—Normal.

Lymphatic Glands.—The iliac, pelvic, inguinal, and axillary glands were normal.

Two Lumbar Glands contained softening yellow miliary tubercles. A third, the size of a pea, was filled with soft creamy pus.

A Sternal Gland, the size of a small pea, was yellow and softened throughout.

Microscopical Examinations.

Tonsils.—Very numerous tubercle bacilli.

Lung.—Numerous tubercle bacilli.

Cerebro-spinal Fluid.—No tubercle bacilli.

LEMUR 4.

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—June 2nd, 1905.

Died.—August 20th, 1905, 79 days after feeding.

Clinical History.

The lemur was first noticed to be ill three weeks after feeding; he was quiet and seemed to have lost appetite.

He soon became obviously ill, depressed and weak, and during the month of July was scarcely able to jump up on to his perch.

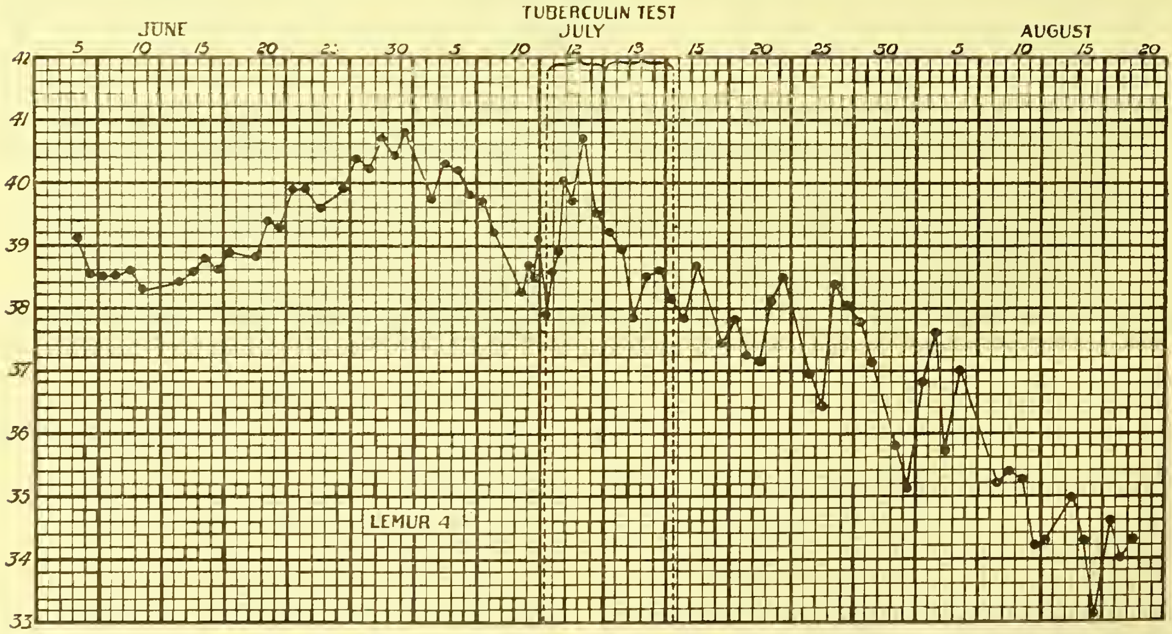
On August 1st there was an improvement in his condition; he had a better appetite and was more lively and active.

The improved condition was not of long duration; he became weak and depressed again, sitting on the floor of his cage with head bent down and quite unable to climb on to his perch. He died on August 20, 1905.

There was no diarrhœa and no increase in respiration during the experiment.

Tuberculin Test.—July 12, 1905. 40 days after feeding, Positive. Rise of temperature 1·6°C.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Condition.—Poor. Absence of fat in the body.

Larynx and Pharynx.—Normal.

Tonsils.—Well marked. Normal in appearance.

Retro-pharyngeal Glands.—None enlarged.

The Submaxillary Glands were a little enlarged and contained soft caseous miliary tubercles throughout their substance.

Cervical Glands.—In the neck on each side of the trachea and lower part of the thyroid cartilage in the anterior triangular space were two soft fluctuating glands, each about the size of a pigeon's egg. They were easily separated from the tissues around, being only slightly adherent to the sterno-mastoid. On section they were found to be filled with soft caseous substance.

In the posterior triangle on the left side was a gland ½ inch long; it was partially caseous and softened. The corresponding gland on the right side was quite small and contained a few opaque foci in the cortex.

Under the angle of the jaw on the right side was an enlarged soft and caseous gland.

The glands immediately dorsal to the clavicle were on the right side two in number; one was an inch long and over ½ inch wide and contained numerous soft caseous foci throughout its substance; the other was small and contained discrete opaque grey foci.

The corresponding glands on the left side were not enlarged and a few opaque foci could be seen in one.

Abdomen:

Peritoneum and Mesentery.—Normal.

Omentum contained a few grey translucent tubercles.

Stomach.—Normal.

Small Intestine.—In the small intestine, about 4 inches from the pylorus, was a small caseous deposit (2 mm.) in the mucous membrane. About eight of the Peyer's patches contained a few small opaque tubercles which could be seen from the peritoneal surface. The patches were a little thickened and the tubercles could be felt. There was no ulceration; the mucous membrane appeared longer in these regions than elsewhere.

Large Intestine.—Normal.

The Pyloric Gland was rather larger than a pea and was soft and caseous throughout.

The Mesenteric Glands were represented by a rounded fluctuating mass, about the size of a hen's egg, with nodules around it consisting of five smaller adherent glands.

They were yellowish in colour and completely softened.

There was a gland in the meso-colon near the rectum about half an inch long, caseous throughout. Besides these there were no other glands about the alimentary canal.

The Spleen was enlarged and resembled a horse shoe in shape. It was three and a quarter inches long, two and a half inches wide and three-quarters of an inch at its thickest part. It contained very numerous large irregular caseous nodules, varying in size from 2 and 3 mm. up to about 12 mm. in diameter. They were softening slightly in the centre.

The Kidneys were very pale and appeared normal except for a few transparent foci.

The Liver contained fairly numerous minute grey foci, varying a little in size.

The Portal Gland was large soft and caseous.

The Lumbar Glands contained greyish opaque foci up to a pinhead in size arranged round the cortices.

Iliac Glands.—Not affected.

Thorax:

The Lungs were crepitant. All the lobes contained numerous grey tubercles, ranging in size from a millet seed up to a pea. The small ones were quite hard and felt like small shot. They were grey and translucent with opaque centres. The larger ones were firm from the outside and on section were opaque and caseous and beginning to soften in the centre.

In the right middle lobe about the centre the nodules were aggregated into a small mass and the lung tissue beyond towards the apex was collapsed and airless.

Thoracic Glands.—Behind the division of trachea into the bronchi there was a gland the size of a sparrow's egg which was soft yellow and caseous throughout. A small gland on either side contained a few minute opaque foci.

There were three dorsal mediastinal glands in a chain near the diaphragm which contained irregular caseous foci in the cortices.

Heart.—Normal.

Right Sternal Gland contained two minute opaque foci.

Axillary Glands contained a few opaque caseous foci.

Left Inguinal was enlarged and contained a soft yellow nodule.

Right Inguinal.—Normal.

Microscopical Examination.

Left Cervical Gland	A few tubercle bacilli.
Axillary Gland -	
Kidney - - -	
Liver - - -	

Intestine.—Two patches contained a moderate number of tubercle bacilli; one contained a few only.

LEMUR 2.

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—June 2nd, 1905.

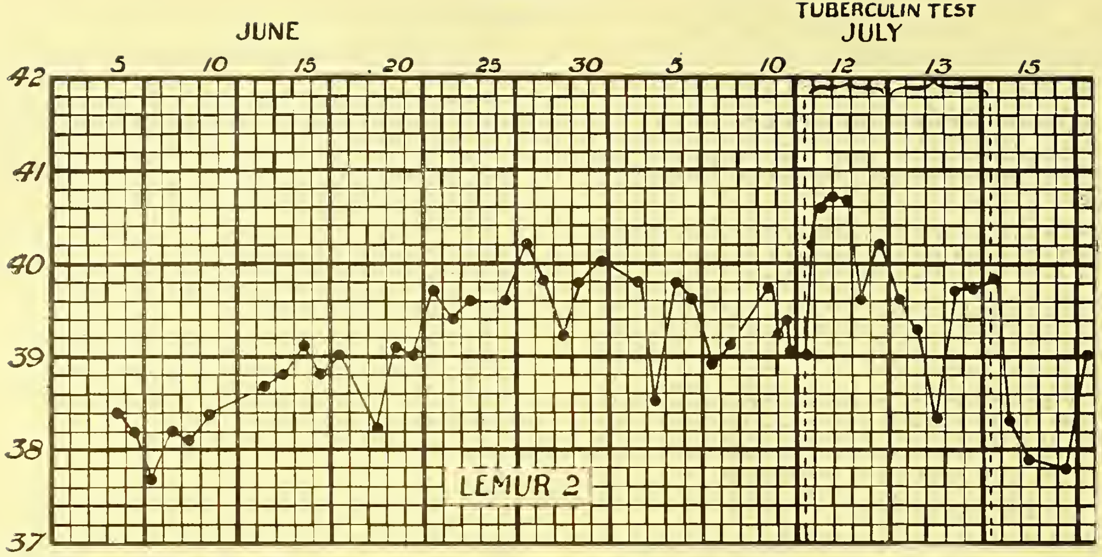
Killed.—July 18th, 1905, 46 days after.

Clinical History.

The lemur became ill about a month after being fed; he was quieter, ate less food and was obviously weaker. During the remainder of the experiment he became weaker and more depressed and seemed not to have strength enough to jump up on to his perch. There was no diarrhœa.

Tuberculin Test.—July 12, 1905. 40 days after inoculation. Positive. Rise of temperature 1·3°C.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Body.—Thin.

Tongue and Pharynx.—Normal.

Tonsils were prominent and firm, but were not apparently enlarged; there was no sign of caseation or ulceration.

Both Submaxillary Glands were enlarged and showed on section irregular yellow softened areas up to about 2 mm. in diameter.

Right Pharyngeal Gland, the size of a thrush's egg, was soft yellowish and fluctuant; on section thin greenish yellow pus exuded; the cut surface showed yellow breaking down areas of necrosis replacing the greater part of the substance.

The Pharyngeal Gland on the opposite side was slightly enlarged and resembled the submaxillary.

Cervical Glands.—In the posterior triangle, above the left clavicle, there was a soft fluctuating tumour the size of a pigeon's egg, which on section contained necrotic masses and thin turbid greenish puriform fluid. Just above this there was a small gland which showed early (yellow) necrosis in the cortex.

In the right posterior triangle there was a slightly enlarged gland which was closely beset with softened caseous tubercles.

Right mid-cervical gland normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—5 in. from the pylorus there was a prominent nodule, the size of a wheat grain, with a soft yellow centre; in the rest of the intestine there were about sixteen ulcerated areas; these were most numerous towards the lower end and appeared to have arisen in Peyer's patches; near the ileo-coecal valve there were four large ulcerated areas situated close together; three measured 2 cm. in length by 1 cm. in breadth; the fourth 4 by 2 cm.; they had slightly raised margins and irregular shreddy necrotic floors showing here and there yellow points; the other areas varied in length from 0·5 to 1 cm. and were generally oval in outline; some showed the whole of the surface ulcerated; others showed several small ulcers with congested mucous membrane between: where the whole of the surface of a patch was not ulcerated the submucous tissue showed yellow softened caseous material: the serous surface of the intestine was unaffected.

Large Intestine.—In the cæcum were several punched out ulcers with broad slightly raised opaque white margins and thin undermined edges: in the upper part of the colon were similar ulcers but these had yellowish white congested margins; the bases of the ulcers were not thickened and there was no discharge from the floors.

Gastric Glands.—A precardiac gland contained a softened greyish white focus.

The Mesenteric Glands were enlarged and partly fused together; on section they exuded yellow viscid pus, which more or less completely replaced the gland tissue.

An Ileo-colic Gland, 1 cm. in diameter, was yellow caseous and softened practically throughout.

Three Colic Glands were caseous and softened; a fourth, near the root of the mesocolon, showed caseation affecting the cortex only.

Spleen.—Pale (length 3in.) showed on section 24 to 30 yellow spherical caseous and softened tubercles ranging from 1 to about 2 mm. in diameter.

The Liver showed on the surface under the capsule scattered minute greyish white tubercles; on section similar tubercles were sparsely scattered throughout.

Portal Gland.—A gland in the small omentum, the size of a kidney bean, showed foci of greyish white pus in the cortex (this gland lay nearer the duodenum than the liver).

The Left Kidney showed on the surface four grey foci, one 1 mm. in diameter, the others about 0·5 mm.; on section they were not definitely circumscribed, the largest one extended into the cortex as a radial streak.

The Right Kidney contained three grey tubercles each about the size of a millet seed.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Normal.

Pleura.—Normal.

The Lungs were pinkish in colour and crepitant throughout; in the right upper lobe there was a firm nodule about 8 mm. in diameter; this projected about 2 mm. above the general surface and was adherent to the parietal pleura; on section it was composed of firm yellow caseous tissue with a marginal zone of greyish red translucent tissue.

The right mid and lower lobes were normal.

In the left lower lobe there were two similar nodules, one about 8, the other 6 mm. in diameter; the former projected from the surface and was adherent to the diaphragm; the latter was situated in the middle of the lobe and was surrounded by a zone of intense congestion.

In the anterior part of the left upper lobe there was a smaller caseous nodule.

Bronchial Glands.—A right praetracheo-bronchial gland showed in the cortex about half a dozen small soft yellow nodules; on the left side two glands showed similar yellow areas in the cortex.

Lumbar, Axillary and Inguinal Glands.—Normal.

Microscopical Examination.

Margin of Ulcer in Cæcum.—3 T.B. after long search.
Tonsil (crushed between glass plates).—10 T.B.
Submaxillary Gland.—8 T.B.
Duodenal Nodule.—A few T.B.
Right Bronchial Gland.—6 T.B.

MANGABEY MONKEY 2. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

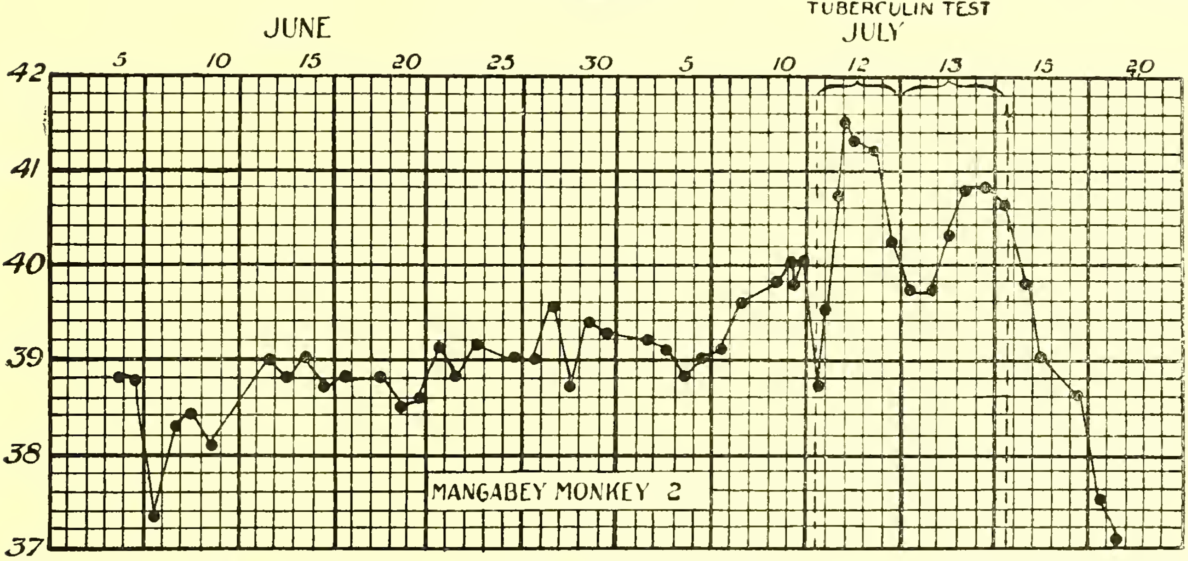
Killed—July 19th, 1905, 47 days after feeding.

Clinical History.

There was no sign of ill-health during the experiment.

Tuberculin Test.—July 12, 1905, 40 days after feeding. Positive. Rise of temperature 1·5° C.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours ; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine: In the first 3 or 4 inches of the duodenum there were three small ulcers, the mucous membrane around which was slightly raised above the general mucous surface ; between the finger and thumb the margin of the ulcers felt a little thickened, but there was no sign of caseation at the bases or in the surrounding tissues ; 7 inches from the pylorus there was a slightly larger irregular ulcer the mucous membrane around which was congested ; on section a yellow point was seen in the submucous tissue under one of the margins of the ulcer ; there were no subperitoneal tubercles : about 22 inches and 14 inches respectively from the ileocœcal valve were two small ulcers similar to those first described.

Large Intestine.—Normal.

Gastric Glands.—Normal.

Duodenal Glands.—A small gland on the surface of the head of the pancreas was normal : one on the inferior surface, the size of a sparrow's egg, was partly caseous and softened.

Mesenteric Glands.—Two of the anterior mesenteric glands were enlarged ; one was the size of a blackbird's egg, the other slightly smaller ; the former was yellow externally, soft and fluctuant and filled with soft greenish yellow caseo-pus ; the other gland contained an abscess cavity which replaced about three-fourths of the substance. In the posterior part of the mesentery there were two slightly enlarged glands, which showed on section cavities up to 3 mm. in diameter filled with greenish yellow pus ; these were situated in the cortex and could be seen through the capsule as yellowish areas ; near the latter glands were several small glands ; these were normal with the exception of one which contained a yellow purulent focus.

Ileo-colic Glands.—Normal.

Colic Glands.—A mid-colic gland the size of a sparrow's egg was a thin-walled cyst filled with greenish yellow caseo-pus ; other colic glands were normal.

The Spleen was not enlarged : in the pulp under the capsule a minute yellow point was seen ; this was soft and could be easily picked out on the end of a scalpel ; spleen otherwise normal.

Splenic lymphatic gland, normal.

Liver.—Just under the capsule were sparsely scattered spherical opaque whitish tubercles less than 0·5 mm. in diameter ; besides these were four larger tubercles about 1 mm. in diameter ; the latter had opaque whitish centres and grey margins. On section minute whitish tubercles were sparsely scattered throughout.

Portal Gland.—Normal.

Kidneys.—On the surface of the left kidney there was a suspicious grey focus : right kidney normal.

Suprarenal Bodies.—Normal.

Thorax:

Heart and Pleura.—Normal.

Lungs: in the right upper lobe near the dorsal mediastinal surface there was a firm nodule measuring a little over 1 cm. in greatest diameter ; this on section was composed of yellow caseous partly softened tissue surrounded by a zone of greyish red tissue : the rest of the lung was normal.

Bronchial Glands: two right praetracheo-bronchial glands were enlarged ; one was the size of a pea and was caseous and softened throughout ; the other was 1·5 cm. in length and contained two abscess cavities replacing over half the substance of the gland.

One of the Left Praetracheo-Bronchial Glands contained a minute opaque yellow point. Intertracheo-bronchial glands, normal.

Axillary, Inguinal, Iliac and Lumbar Glands.—Normal.

Microscopical Examination.

Mesenteric Gland.—Moderately numerous T.B.

Spleen.—A few T.B.

Tongue (Secretion in Follicle) *Liver* *Kidney* *Left Bronchial Gland*	No T.B.

MANGABEY MONKEY 4.

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

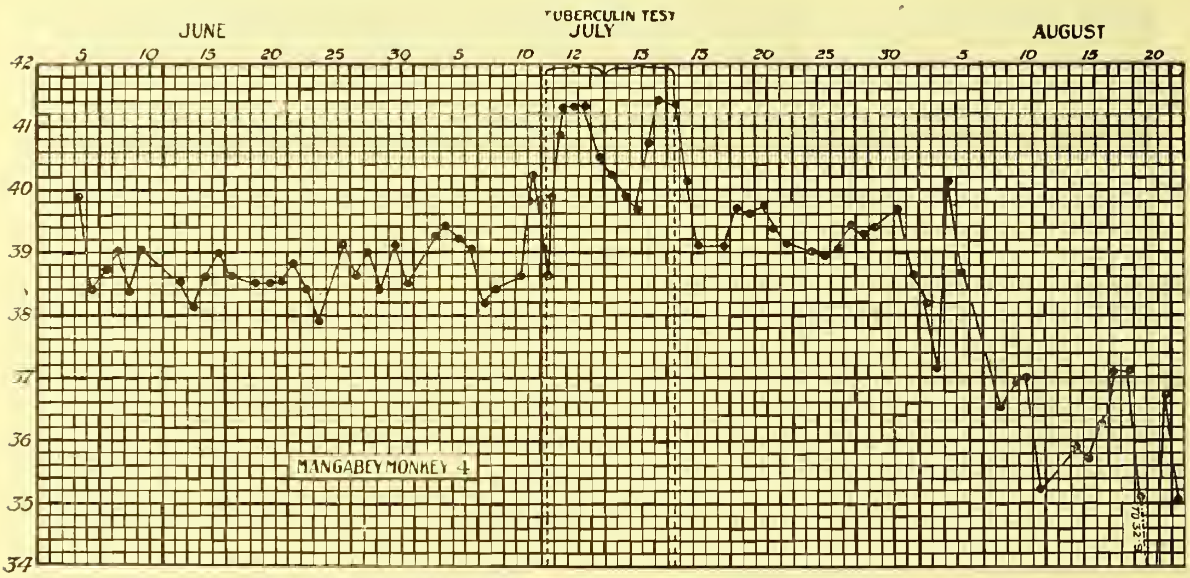
Killed—August 25th, 1905, 84 days after feeding.

Clinical History.

The monkey was quite well and active until about the second week in August when she began to grow thin and weak; she quickly became thinner and weaker, walking about the cage with difficulty, and died on August 25th.

Tuberculin Test.—July 12, 1905. Positive, rise of temperature 1·1°C. Maximum, 41·3°C.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Tonsils and Pharyngeal Mucous Membrane.—Normal.

Retro-pharyngeal Glands.—Normal.

A Left Submental Gland contained a minute caseous focus.

Submaxillary and Cervical Glands.—Normal.

Axillary Glands.—A gland in the left axilla showed a small caseous tubercle. The right axillary glands and the inguinal glands were normal.

The Thyroid Body on the left side showed a minute soft white focus.

Abdomen:

The Omentum contained about half a dozen millet seed sized tubercles caseous in the centre, and several smaller glistening transparent tubercles.

Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—The upper part of the small intestine showed five transverse ulcers situated 5, 9, 33, 36, and 48 inches respectively from the pylorus; the rest of the intestine was normal; the ulcers varied in length from 5 to 10 mm. and had raised thickened, sometimes irregular, margins showing no sign of caseation; they penetrated the muscular coat, the bases of the ulcers being formed by slightly thickened peritoneum; two of the ulcers showed small subperitoneal tubercles, whilst around a third the peritoneum for a good distance was studded with little tubercles, none of which however were situated opposite the base.

Large Intestine.—Normal.

Gastric Glands.—Normal.

The Mesenteric Glands were considerably enlarged and were united together to form a soft fluctuant nodulated mass measuring roughly 3½ in. by 2 in. by 2 in.; the serous surface of the mass was white and fibrous-looking, except around the margins where there were several rounded yellow prominences; at the latter places the capsules of the glands were extremely thin; on section all the glands were caseous throughout and were filled with soft greenish yellow caseo-pus; in several places the capsules of contiguous glands had broken down, thus forming large thin-walled loculated cavities. The third part of the duodenum was in close contact with and surrounded the upper extremity of the mesenteric mass. Many of the lacteal vessels in the mesentery attached to the upper part of the intestine showed strings of small tubercles; several were thickened and caseous and showed nodular enlargements; at one part (near an ulcer) caseous lymphatic vessels ramified under the serous coat of the intestine and between the muscles; in other places the subserous lymphatic vessels were distended with clear fluid.

The Ileo-colic Glands were swollen and on section discharged blood-stained serous fluid; no caseation.

Colic Glands.—Two small colic glands contained caseous nodules; the rest were normal.

At the root of the mesentery, immediately in front of the great vessels, were three glands, the largest the size of a broad bean; these were caseous and softened practically throughout.

Behind the vessels in close contact with the lumbar vertebrae was a chain of enlarged glands the largest the size of a kidney bean, which contained softened caseous areas replacing the greater part of the gland tissue.

Three Pancreatic Glands showed caseous areas in the cortex.

The Spleen was little if at all enlarged; the pulp contained moderately numerous soft yellow caseous nodules, varying very much in size, the smallest being about the size of a pin's head, the largest that of a pea; the nodules could be seen through the capsule, the larger ones causing slight projections above the surface.

Two Glands in the hilum of the spleen were slightly enlarged and contained soft caseo-pus; other glands in the gastro-splenic omentum were normal.

The Liver substance was closely beset with tubercles mostly ranging from about 0·5 to 1 mm. in diameter; there were also a few larger tubercles, up to 2 mm. in diameter, and numerous minute grey specks just visible to the eye; the smaller tubercles had grey margins and caseous centres: the larger ones were uniformly caseous; several of the tubercles that lay just under the capsule showed on the surface of the liver a delicate transparent fringe.

Portal Glands.—Two glands in the smaller omentum contained pin-head sized caseous tubercles; one situated just above the pylorus was similarly affected.

Kidneys.—The right kidney showed in the cortex six greyish-white caseating tubercles the largest 1 mm. in diameter; two of these were seen on the surface, four in the depth; each was surrounded by a zone of congestion.

In the left kidney four soft caseous tubercles, the largest 1·5 mm. in diameter, and two minute greyish-white foci were seen on the surface; in the depth of the cortex there were four small caseous tubercles.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Normal.

Lungs.—The left caudal lobe was slightly adherent to the diaphragm: evenly distributed throughout both lungs were fairly numerous discrete nodules ranging in size from a small shot to a large pea; the larger nodules were almost uniformly caseous and were beginning to soften; the smaller ones had firm friable caseous centres and grey translucent margins. The left lobes collapsed well; the right remained expanded and were congested and œdematous.

The Praetracheo-bronchial Glands on each side appeared to be unaffected; an inter tracheo-bronchial gland was slightly enlarged and contained three soft yellowish white caseous areas, each about 2 mm. in diameter.

Behind the pleura lying on the dorsal vertebrae, just above the diaphragm, were two enlarged extensively caseated and softened glands.

Diaphragm.—Around the margins of the tendon on the left side were numerous small grey tubercles with opaque centres; in the centre of the tendon there was a slightly elevated growth about 1 cm. in diameter which consisted of grey translucent tissue with central caseous points; the lung was adherent to this growth; on the right side there was a row of small tubercles along one margin and scattered tubercles on the central part.

Pleura covering ribs, normal.

Brain.—Normal.

Microscopical Examination.

Lumbar Gland *Submental Gland* *Kidney*	Numerous T.B.

Axillary Gland.—Very numerous T.B.

Thyroid Body.—Fairly numerous T.B.

MANDRILL BABOON 54. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

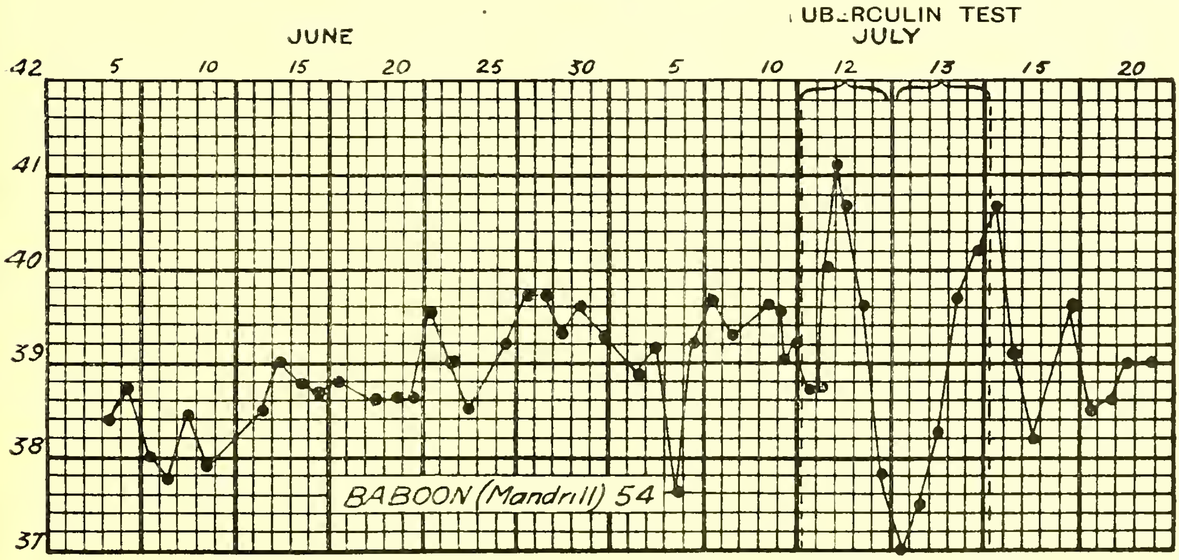
Killed—July 21st, 1905, 49 days after feeding.

Clinical History.

On July 18 the baboon was noticed to have some difficulty in breathing, inspiration being accompanied by a snoring noise; this difficulty increased during the next three days and was very marked on the morning of the day it was killed; there was no increase in the rate of respiration, the difficulty in breathing being due apparently to some nasal obstruction; there were no other signs of ill-health.

Tuberculin Test.—July 12, 1905. 40 days after feeding. Positive. Rise of temperature; 1·5°C. Maximum, 41·1°C. four and a half hours after inoculation.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Condition.—Moderate.

Tongue and Pharynx.—Normal.

The Right Tonsil was slightly enlarged and on section was found to be in a state of caseation; in the crypt of the tonsil a little whitish purulent material had collected but there was no definite ulceration of the mucous membrane.

The Left Tonsil appeared normal.

Retro-pharyngeal Glands.—The posterior wall of the pharynx showed two rounded swellings one on each side of the mid line; these, projecting forwards, greatly constricted the opening of the fauces; on section they were seen to be caused by a series of enlarged glands which were caseous and softened practically throughout, exuding thick creamy yellow pus; the capsules of the glands were thickened and adherent to each other and the surrounding structures.

Submaxillary and submental glands.—Normal.

Cervical Glands.—On the left side under the insertion of the sterno-mastoid muscle and closely applied to the base of the skull there was a gland the size of a thrush's egg which was caseous and softened throughout; the capsule was much thickened; under the posterior belly of the digastric there was a gland the size of a kidney bean which contained soft caseous areas replacing about half the substance; between the latter and the one situated under the sterno-mastoid were three small glands one of which contained a caseous focus; the glands in the posterior triangle showed no foci of caseation.

On the right side the cervical glands were normal to the naked eye.

Abdomen :

Omentum and Peritoneum.—Normal.

Stomach.—The mucous membrane along the great curvature showed a group of six raised rounded eminences about the diameter of a split pea in the centre of each of which was a small ulcer; on section each showed in the submucous tissue a collection of caseo-pus which could be readily squeezed through the opening in the mucous membrane; near the latter were three or four softened caseous nodules over which the mucous membrane was intact; on the serous surface there was a small subperitoneal tubercle.

Small Intestine.—In the duodenum there were three transverse ulcers, the largest 7 to 8 mm. in length; these had undermined margins and shreddy floors; they were quite superficial, no thickening or caseation at the bases being detected; towards the lower end of the ileum there was an irregular transverse ulcer 1 cm. in greatest diameter the base of which was very slightly thickened.

Large Intestine.—Normal.

Gastric Glands.—Two precardiac glands contained soft caseous foci; a gland in the lesser curvature of the stomach showed a small cavity filled with creamy yellow caseo-pus.

Two glands along the greater curvature of the stomach were enlarged, partly caseous and softened.

Mesenteric Glands.—In the upper part of the mesentery there were four enlarged glands, the largest the size of a sparrow's egg; on section they were caseous and softened almost throughout; the capsules were thickened; in the mesentery (which at this part was very short) between these glands and the bowel were numerous opaque whitish millet seed sized tubercles arranged along the lacteal vessels. Two small glands situated at about the junction of the middle and lower thirds of the mesentery showed softened caseous areas. Near the lower end of the ileum two glands fused together to form a mass the size of a sparrow's egg were caseous and softened almost throughout. Other mesenteric glands were normal.

Ileo-colic Glands.—On one side of the junction of the ileum and colon there was a gland the size of a kidney bean, which contained a caseous area replacing about a third of the substance; two small glands lying further along the colon showed caseous foci; on the opposite side there was a slightly enlarged gland which was partly caseous and softened.

Colic Glands.—A mid colic gland contained a soft caseous nodule 2·5 mm. in diameter: other colic glands were normal.

Spleen.—The spleen was slightly enlarged ($2\frac{5}{8} \times 1\frac{1}{2} \times \frac{1}{2}$ in.); the surface was irregular; the pulp was firm and red and contained two caseous nodules each about 2 mm. in diameter.

Many of the lymphatic glands in the splenic omentum were enlarged partly caseous and softened.

The Liver showed on the surface under the capsule two or three minute grey foci (? early tubercles); on section the substance was normal.

The Left Kidney showed on the surface a pearly spherical mustard-seed sized body which was readily shelled out from the kidney substance.

Right Kidney.—Normal.

Suprarenal Bodies.—Normal.

Lumbar, Coeliac and Iliac Glands.—Normal.

Thorax :

Heart.—Normal.

Pleura.—Normal.

Lungs.—The left upper lobe contained a firm nodule, 4 mm. in diameter; this had a yellow caseous centre and a grey translucent margin. On the dorsal surface of the right lower lobe there was a purplish-black patch raised above the surface and solid to the touch; this on vertical section was found to be the base of a more or less wedge-shaped haemorrhagic mass, the cut surface of which had a chocolate brown colour.

Bronchial Glands.—Normal.

Microscopical Examination.

Mesenteric Gland.—Moderately numerous T.B.

Right Tonsil.—Moderately numerous T.B.

Spleen.—Moderately numerous T.B.

Left Kidney.—No T.B

MANDRILL BABOON 56. (Young.)

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

Died—August 14th, 1905, 73 days after feeding.

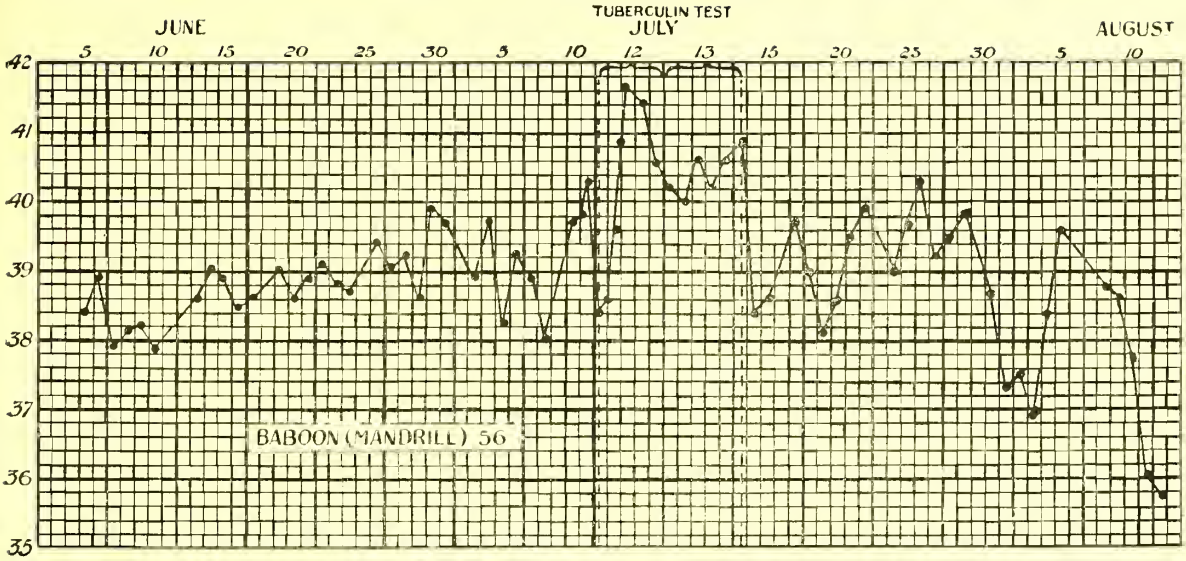
Clinical History.

There was very little change in the general condition until about July 18th, when he was noticed to have some difficulty in breathing through his nose, inspiration being accompanied by a snoring noise: there was at this time a discharge of muco-pus from the nostrils.

The difficulty in breathing became more pronounced and there was a constant discharge of muco-pus, chiefly from the left nostril. The appetite throughout remained moderately good, but he became gradually thinner and weaker and died on August 14, 1905.

Tuberculin Test.—July 12, 1905. 40 days after feeding. Positive, rise of temperature, 1·4° C. Maximum temperature 41·7° C., 6 hours after inoculation.

Temperature.



The temperatures between the dotted vertical lines were taken after the inoculation of tuberculin, and each division of the chart here represents an interval of 3 hours; elsewhere in the chart each division represents one day.

POST-MORTEM EXAMINATION.

Condition.—Poor.

Tongue, Pharynx and Larynx.—Normal.

Both Tonsils were enlarged and yellow nodules could be seen in them. On section they were caseous and softened.

The Right Submaxillary Gland was the size of a pea and contained two yellow miliary tubercles. On the right side there were two glands which were not enlarged; one contained minute opaque foci in the cortex.

Cervical Glands.—On the right side of the neck there was a mass of glands extending from below the thyroid cartilage into the posterior triangle and lying against the spine. On section the glands were filled with soft yellow caseo-pus.

On the left side there was a rather smaller similar mass lying against the spinal column and meeting in the mid line behind the larynx with the mass on the other side. This was softened and caseous throughout. On dissecting out the pharynx both masses of glands were found to extend to the base of the skull and to the posterior nares.

Abdomen:

The Omentum contained scattered grey tubercles about 1 mm. in diameter; a few with central opacities.

A small gland in the omentum near the spleen was yellow caseous and softened.

Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—About 2 feet from the pylorus was a small oval ulcer 6 mm. long. There was no thickening, the base being thin but slightly caseous.

There was a second circular punched out ulcer 2 mm. in diameter; the edges were slightly opaque and caseous. In a Peyer's patch nearer the colon were four very small, slightly irregular ulcers with no thickening. A Peyer's patch about 9 in. from the ileo-coecal valve contained one small circular ulcer 2·5 mm. in diameter. Its edges were slightly raised and the base consisted of the peritoneum.

Large Intestine.—Normal.

The Pyloric Gland.—A quarter of an inch long, was almost entirely caseous and softened.

Cardiac Gland.—Normal.

The Mesenteric Glands.—Were greatly enlarged, obliterating the mesentery so that the small intestine was bound down to them. They were adherent; five could be separated at the anterior extremity ranging in size from $\frac{1}{4}$–$\frac{1}{2}$ in. long; there was a mass in the centre 1 in. by $\frac{3}{4}$ in. by $\frac{1}{2}$ in. and three smaller glands fused together posteriorly. They were all soft yellow and caseous throughout, with a thin external capsule. In the rest of the mesentery, not bound down, were six single soft caseous glands from $\frac{1}{4}$ to $\frac{1}{2}$ in. long. At the junction of the ileum and colon were about twelve small glands only two of which each contained a soft yellowish nodule.

One colic gland the size of a pea was caseous and softened, the rest appeared normal.

The Spleen.—$1\frac{3}{4}$ in. by 1 in, by $\frac{1}{2}$ in. had projecting slightly from the surface several yellowish tubercles from 1 mm.–7 mm. in diameter. On section the tubercles were opaque yellowish and soft in the centres. In the substance were three more yellowish tubercles and numerous grey transparent foci some of which were opaque in the centre.

The Liver contained very numerous grey tubercles ranging in size from a pin-point up to 1 mm. The largest had minute opaque spots in the centre.

Two Small Glands in the hilum of the spleen were normal.

Kidneys.—In the left kidney there were seven grey tubercles with opaque centres each about 1 mm. in diameter.

In the right kidney there were eleven, the largest about a pinhead in size and projecting slightly from the surface. Several were opaque and slightly yellow in the centre.

Suprarenals.—Normal.

Lumbar and Iliac Glands.—Normal.

Thorax:

Lungs.—The left lung was adherent to the chest wall all round; dorsally it could be separated from the ribs; ventrally it was firmly adherent leaving a ragged surface.

The right lung was firmly adherent at its base to the diaphragm.

The pericardium was adherent to the pleura on the left side.

The anterior lobe of the left lung was in a condition of caseous pneumonia being replaced almost entirely by soft yellow caseo-pus. The caudal lobe contained two pea-sized yellow nodules where it was adherent to the cephalic lobe; the rest of the lobe contained numerous small grey tubercles with opaque centres.

In the right lung there were numerous tubercles ranging in size from a grey point up to a pinhead. In the middle lobe there was a cavity about quarter of an inch in diameter with thin fibrous walls filled with softening caseous substance.

Bronchial Glands were enlarged and contained soft yellowish nodules replacing about half their substance. At the anterior extremity of the heart surrounding the great vessels there was a mass of glands fused together and adherent to the left lung. The gland substance was almost entirely replaced by soft yellow caseo-pus.

Heart.—Normal.

Inguinal and Axillary Glands.—Normal.

Brain.—Normal.

Microscopical Examination.

Tonsil.—Moderate number of T.B.

Bronchial Gland.—Moderate number of T.B.

Intestine (2 ulcers).—A few T.B.

Iliac Gland.—No T.B.

CALF 382.

Age—13 weeks.

Fed once with culture derived from the original material of Virus B. IX. (The culture used was the 28th generation, 21 days old.)

Date—February 7th, 1906.

Dose—1·0 milligramme.

Killed—March 29th, 1906.

Duration of Experiment—50 days.

Clinical History.

There were no signs of illness during the experiment and the temperature remained practically normal throughout.

Weights.

	cwt.	qrs.	lbs.
February 7th, 1906 - -	1	0	0
February 21st, 1906 - -	1	0	13
March 20th and 29th, 1906 -	1	1	7

Gain in weight.—22 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In fair condition.

Tongue and Pharynx.—Normal.

The Right Tonsil showed on section two or three minute yellow foci which could not be picked out on the point of a scalpel; the left tonsil contained two soft yellow foci.

The Retro-Pharyngeal Glands were not enlarged but seemed a little firmer than normal; on section in each case the cortex contained numerous yellow caseous foci, some of which were gritty; they were irregular in outline and in places formed a broken network.

Submaxillary, Parotid and Cervical Lymphatic Glands.—Normal.

Abdomen.

There was an excess of serous fluid in the peritoneal cavity.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Gastric Glands.—Normal.

Mesenteric Glands.—The glands in the anterior part of the mesentery were normal; in the middle third two glands showed in the cortex each a small group of minute yellow points; two others contained each a firm nodule, the largest the size of a small pea; one of these was composed of greyish translucent tissue containing yellow streaks of caseation, some gritty; the other nodule was irregular caseous and gritty from calcification; the glands in the posterior third of the mesentery showed three small groups of minute yellow foci.

Ileo-Colic Glands.—One showed a small patch of the cortex beset with irregular yellow foci; this part of the cortex seemed a little firmer than normal. Other ileo-colic glands were normal.

Colic Glands.—Normal.

Spleen.—8 ozs. Normal on section.

Liver, Portal Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura, Lungs, Bronchial Glands.—Normal.

Mediastinal Glands.—The long caudal mediastinal gland showed two yellow calcareous foci in the cortex; other mediastinal glands were normal.

Various Lymphatic Glands.

Cœliac, Renal, Lumbar, Iliac, Precrural, Popliteal, Gluteal, Ischiatic, Prescapular, Prepectoral and Axillary Glands.—Were normal.

Testicles, Urinary Bladder, Eyes.—Normal.

CALF 380.

Age—13 weeks.

Fed once with culture obtained from the original material of Virus B. IX. (The culture used was 28th generation, 21 days old.)

Date—February 7th, 1906.

Dose—1·0 milligramme.

Killed—June 27th, 1906.

Duration of Experiment—140 days.

Clinical History.

About the beginning of April the calf began to experience some difficulty in breathing, inspiration being accompanied by a snoring noise; this difficulty gradually became greater and finally caused much distress, particularly after drinking; the obstruction was evidently due to enlargement of the pharyngeal glands. Enlarged glands near the angles of the jaw were felt about the beginning of May; these gradually increased in size and on the right side a large prominent fluctuating swelling developed.

The general condition of the animal remained fair, but growth was retarded probably because the animal was unable to take a sufficient amount of food owing to the obstructed condition of its pharynx.

Tuberculin Test.

May 31st, 1906.—113 days after the experiment began. Positive. Rise of temperature 1·5° C.

Temperature.

The temperature during the first three weeks was normal; it then began to fluctuate and during the rest of the experiment was irregular, never rising, however, beyond 39·9° C.

Weights.

	cwt.	qrs.	lbs.
February 7th, 1906 - - -	1	0	16
February 21st, 1906 - - -	1	1	0
March 20th, 1906 - - -	1	1	4
April 18th, 1906 - - - -	1	1	6
April 24th, 1906 - - - -	1	1	5
May 15th, 1906 - - - -	1	1	3
June 5th, 1906 - - - -	1	1	5
June 25th, 1906 - - - -	1	1	20
June 27th, 1906 - - - -	1	1	9

Gain in weight.—21 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Alimentary Tract:

Tonsils.—The left tonsil was considerably enlarged, measuring 2½ in. by 1½ in. by 1½ in.; on section it was composed of dense translucent tissue penetrated with a yellow necrotic network and containing here and there softened caseous areas; the orifice and crypts of the tonsil were dilated and lined by smooth mucous membrane which showed no sign of ulceration.

The right tonsil was somewhat smaller than the left but resembled it on section.

Tongue and Pharyngeal Mucous Membrane.—Normal.

Submaxillary Glands.—The gland on the left side contained a caseo-calcareous mass, the size of a thrush's egg, with dense cicatricial patches in the centre. The gland on the right side was normal.

Parotid Glands.—The left parotid gland was enlarged and showed about half its substance composed of caseo-calcareous masses similar to those in the submaxillary gland.

The right parotid gland showed in the cortex a dense gritty caseous nodule, the size of a broad bean.

Cervical and Pharyngeal Glands.—On the right side of the neck near the angle of the jaw there was a prominent spherical swelling, the size of an orange, the skin over which was on the point of breaking down; on section the swelling was found to be a cyst with thick caseo-purulent contents and thin fibrous walls lined internally with a thin layer of granulation tissue. On evacuating the contents of the cyst a funnel-shaped opening was seen in the internal wall which just admitted the little finger; this opening led into the centre of an enlarged superior cervical gland which measured 2 in. by 2 in. by 1½ in; on section the gland was composed of dense gritty caseous substance softened in the centre; the capsule of the gland was very greatly thickened; near this gland was a small spherical gland filled with thick yellow tenacious caseo-pus and surrounded by a thick fibrous capsule.

Between the latter and the larynx there was a tense spherical fluctuating gland, 1½ in. in diameter, the substance of which was almost completely converted into yellow tenacious caseo-pus; the capsule was much thickened and in places infiltrated with tuberculous masses.

In the region of the right pharyngeal gland there was a large irregular mass, adherent to surrounding structures, measuring 4 in. by 2½ in. by 2 in.; on section the mass was composed of the enlarged pharyngeal gland embedded in dense fibrous tissue containing caseating nodules and cavities filled with caseo-pus; the gland was completely converted into a mass of gritty caseous substance breaking down around the periphery. On the left side of the neck extending from the base of the skull to the middle of the neck there was a chain of enlarged glands which together weighed 17 ozs. The superior cervical gland measured 3 in. by 3 in. by 1¼ in. and showed the cortex almost entirely composed of dense gritty caseous material containing two cavities, each the size of a marble, filled with greenish-yellow caseo-pus; the medulla was dense white and fibrous.

Two smaller glands near the latter were casous and calcareous almost throughout.

In the middle of the neck there was a gland the size of an orange with thick fibrous walls and greenish-yellow caseo-purulent contents; this gland was situated between the oesophagus and the spine, the former arching over it and being closely adherent to its capsule; the latter at one point was very thin, and would in a short time have ruptured into the oesophagus.

Behind the left tonsil and closely adherent to it there was a large irregular mass measuring 3¼ in. by 3 in. by 2 in.; this at one extremity showed a large caseous gland partially converted into greenish caseo-pus; the rest of the mass was composed of dense white fibrous tissue containing variously sized brownish translucent nodules infiltrated with yellow streaks and foci.

The hyoid bone on this side near its articulation to the skull was in a condition of early necrosis, the periosteum stripping readily from it.

Stomach.—On the mucous surface of the rumen there were numerous projecting nodules ranging in size from 1 up to 3 cm. in diameter; the mucous membrane over the majority of these showed an irregular ulcer the floor of which was smooth and fibrous; on section the nodules were situated in the submucous tissue and were composed of firm greyish tissue containing yellow points and an ill-defined yellow network. The other stomachs appeared normal.

Small Intestine.—The small intestine showed scattered along its whole length numerous typical tuberculous ulcers; altogether there were about sixty-four and all were situated in Peyer's patches; the majority were small and situated in the centre of circular elevations of the mucous membrane; several were large, one measuring 2½ in. by ¾ in., and had very irregular raised margins, thich fibroid base and irregular floor covered with a layer of caseo-pus; on the peritoneal surface of the largest ulcer there was a firm nodular projection, the size of a kidney bean, which on section showed a yellow network; the peritoneum corresponding to another of the larger ulcers was roughened, but there were no tubercles.

Large Intestine.—In the first part of the colon there was a circular ulcer 1 cm. in diameter with raised rounded margins and slightly thickened base showing no sign of caseation.

Gastric Glands.—All the glands about the rumen were enlarged, the largest measuring 2 in. by 1⅛ in. by 1 in.; on section some were composed throughout of dense gritty pinkish-yellow caseous substance; others were composed partly of dense caseous material and partly of fibroid tissue containing gritty foci and a yellow network; the smallest glands consisted of translucent fibroid tissue penetrated with a yellow network; one gland was a cyst with fibrous walls and caseo-purulent contents; another was embedded in a mass of white fibrous tissue closely studded with yellow caseous nodules. The glands around the other stomachs appeared normal.

Mesenteric Glands.—The chain of mesenteric glands showed about twenty-six evenly distributed irregular nodular enlargements ranging in size from 1 in. by ½ in. by ½ in. to 2 in. by 1½ in. by 1 in.; they cut with difficulty and were composed of dense yellow caseous substance distinctly gritty from calcification; most of the nodules showed in the centre a patch of cicatricial tissue.

Ileo-colic Glands.—At the junction of the ileum and cœcum there were six enlarged glands, the largest 1½ in. by 1½ in. by ½ in.; the latter showed on section patches of dense cicatricial tissue, each surrounded by a zone of caseo-calcareous material; the other glands contained nodules similar to those in the mesenteric glands.

Colic Glands.—Normal.

Abdomen.

Omentum.—The lymphatic fringes on the ventral surface, chiefly on the left side, were slightly hypertrophied and contained a few small hard tubercles.

Peritoneum.—The peritoneum covering the left side of the tendon of the diaphragm showed a small group of translucent tubercles surrounded by delicate strands of connective tissue; on the muscle of the diaphragm there was a small flattened translucent growth composed apparently of an aggregation of small tubercles with yellow points in the centre; on the right side of the diaphragm there were numerous flattened grey translucent tubercles.

Spleen.—Weight 10 ozs., showed on the convex surface a flattened reddish growth 1 cm. in diameter containing yellow points; there were also several congested connective tissue processes; on section the pulp contained one yellow calcareous tubercle the size of a pin's head and a caseo-calcareous nodule the size of a hempseed.

Liver.—On the convex surface of the liver there were numerous flattened grey translucent tubercles ranging in size from a mere point up to 2 mm. in diameter; there were similar tubercles on the suspensory ligament; projecting from the concave surface of the liver there was a firm pea-sized caseous nodule containing calcareous particles; near the latter there was a larger fibrous nodule with a small cavity in the centre containing softened material; in the depth of the liver substance three yellow gritty caseous nodules, the largest the size of a hempseed, were found.

Portal Glands.—One gland contained several dense caseo-calcareous areas; another contained a pea-sized fibroid nodule with yellow points some of which were gritty.

Kidneys.—The right kidney showed in the cortex three grey miliary tubercles, one of which had a minute opaque centre. Left kidney, normal.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—On the surface of the lungs there were about half a dozen dark red mushroomed growths, the largest 1 cm. in diameter; on section these were yellow and gritty in the centre. Evenly distributed throughout the lung parenchyma were moderately numerous dark red angular patches, ranging up to 5 mm. or more in greatest diameter; on section most of these were homogeneous, but some contained yellow foci or small calcareous tubercles; besides these there were three or four gritty caseous nodules, ranging in size from a pea to French bean. Under the pleura on the diaphragmatic surface of the left caudal lobe there were several dark red consolidated lobules; the pleura around these was covered with an eruption of transparent granules.

The Mediastinal and Bronchial Glands.—Were enlarged and together weighed 6 ozs. The long caudal gland measured 5½ in. in length and showed the cortex extensively replaced by dense fibro-caseo-calcareous areas, many of which had in the centre a small patch of dense cicatricial tissue. The other mediastinal glands and the bronchial glands were similarly affected.

Pleura.—The parietal pleura showed along the margins of several of the posterior ribs outgrowths of soft pinkish connective tissue.

On the pleura covering the tendon of the diaphragm there were some patches of dark red velvety vegetations and around the margins of the tendon connective tissue outgrowths similar to those on the parietal pleura; there were also a few loosely attached reddish lenticular nodules, with caseous points in the centre, and extremely numerous grey granules.

Heart.—The pericardium covering the aorta showed a velvety red patch. Heart muscle and valves, normal.

Various Lymphatic Glands.

The Cœliac Glands were greatly enlarged; on section some were caseo-calcareous throughout, whilst others were composed of dense caseous areas and fibro-caseo-calcareous tissue; some of the glands showed foci of softening; one gland was surrounded by a zone of fibroid tissue beset with caseating nodules.

The Prescapular, Prepectoral, Axillary, Popliteal, Gluteal, Pudic, Ischiatic, Precrural, Lumbar, Iliac, and Ilio-sacral Glands.—Were normal.

Testicles.—Normal.

PIG 114.

Age.—14 weeks.

Fed with culture derived from the original material of Virus B. IX.

Dose.—1·0 milligramme.

Date.—June 22nd, 1905.

Killed.—July 20th, 1905, 48 days after.

Clinical History.

The animal showed no sign of illness during the experiment.

Tuberculin Test.—July 20th, 1905, forty days after the experiment began. Positive. Rise of temperature 1·9° C.

Weights.

From June 6th, 1905, to July 11th there was a gain in weight of 12 lbs.; during the last nine days there was a loss in weight of 1 lb.

Weight.

June 6th, 1905 - - -	1 qr. 4 lbs.
June 27th, ,, - - -	1 qr. 12 lbs.
July 11th, ,, - - -	1 qr. 16 lbs.
July 20th, ,, - - -	1 qr. 15 lbs.

Total gain in weight, 11 lbs.

POST-MORTEM EXAMINATION.

Tonsils.—On the surface of the right tonsil there was a bluish patch of mucous membrane showing two or three small ulcers; the tonsillar tissue beneath was replaced by soft granulation tissue; left tonsil, normal.

Tongue and Pharynx.—Normal.

Submaxillary Glands.—On the right side two were much enlarged (largest 1½ in. by 1¼ in. by ⅝ in.) and indurated; they showed on section throughout their substance a coarse yellow caseous network, which contained fine calcareous particles. On the left side there were two enlarged glands; these resembled those on the right side, but were not so large nor so advanced in caseation. Other glands in the neck appeared normal.

Abdomen:

The Omentum showed two or three transparent mustard-seed-sized bodies.

Stomach.—Normal.

Small Intestine.—In the terminal Peyer's patch in the ileum there were from eight to ten minute congested ulcers with no thickening nor caseation at the bases; the rest of the intestine was normal.

Large Intestine.—Normal.

Mesenteric Glands.—The glands in the anterior quarter of the mesentery were normal; in the middle part there were several slightly enlarged indurated glands which showed on section irregular yellow caseous areas; further along there were several that were normal; in the posterior quarter all the glands were distinctly enlarged and contained irregular yellow, slightly gritty caseous patches, replacing about half the substance; some of these areas were beginning to soften.

Ileo-Colic Glands.—At the junction of the ileum and colon there was a group of enlarged glands; they resembled on section those in the posterior part of the mesentery.

Colic Glands.—Most of the colic glands were enlarged and in a similar condition.

Glands around Pancreas.—Normal.

Cœliac Glands.—One cœliac gland contained two or three yellow caseous foci, the largest the size of a millet seed.

Liver.—The liver contained fairly numerous greyish-white tubercles, somewhat irregular in outline, evenly distributed throughout the substance; the largest were about the size of millet seeds and had definite opaque white caseous centres.

The Portal Glands were not enlarged; one contained three or four yellow caseous foci and several greyish-white points (? early caseous foci); another showed on section minute greyish-white points.

The Spleen, not enlarged, showed in the pulp about a dozen spherical tubercles ranging from 1 to 1·5 mm. in diameter; the tubercles had grey margins and opaque centres, the latter in the larger ones being distinctly yellow.

Kidneys.—On the surface of the left were two or three grey foci which extended into the cortex as fine grey streaks.

The right kidney showed in the external part of the cortex a grey millet-seed-sized tubercle slightly opaque in the centre; there were also on the surface a few minute grey specks of a doubtful nature.

Suprarenal Bodies.—Normal.

Lumbar Glands.—In one lumbar gland there was a suspicious greyish-white point.

Thorax:

Heart and *Pleura.*—Normal.

Diaphragm.—Normal.

The Lungs contained fairly numerous discrete hard tubercles ranging in size from about 1 or 0·5 up to 2 mm. in diameter; the majority of the tubercles were yellow and caseous in the centre, but some of the smallest ones showed no central necrosis.

Bronchial Glands.—The left bronchial gland showed a few greyish-white foci; the right, one suspicious point; the intertracheo-bronchial gland showed two or three minute foci of caseation.

Peripheral Lymphatic Glands.—Normal.

Microscopical Examination.

Tonsil.—A few T.B.
Spleen - - } No T.B.
Lumbar Gland }

PIG 118.

Age.—Two years.

Fed with culture derived from the original material of Virus B. IX

Dose.—1·0 milligramme.

Date:—June 2nd, 1905.

Killed.—July 20th, 1905, 48 days after.

Clinical History.

There was no disturbance in the general health of the animal during the experiment.

Tuberculin Test.—July 12th, 1905, forty days after the experiment began. Positive. Rise of temperature 2·1° C.

Weights.

There was a steady gain in weight.

June 6th, 1905 - -	1 cwt. 3 qrs. 22 lbs.
June 28th, ,, - -	2 cwt. 1 qr. 8 lbs.
July 18th, ,, -	2 cwt. 2 qrs. 7 lbs.
Gain in weight - -	2 qrs. 13 lbs.
Rate of gain per week - - -	11·5 lbs.

POST-MORTEM EXAMINATION.

Condition.—Very good.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Seven of the Peyer's patches, the majority of which were in the ileum, showed minute ulcers; the last four of these patches each showed several ulcers, whilst those situated more anteriorly contained only one or two; in one of the latter there were two pin-head sized hard translucent bodies under the mucous membrane; the ulcers were mostly star-shaped and exposed very little floor which in some was congested (? healing); the lymphoid tissue beneath the ulcers was slightly thickened, the thickening being felt on passing the patch through the finger and thumb; on section the thickened base showed in a few instances an opaque whitish or yellowish white focus; the serous surface of the small intestine was normal.

Large Intestine.—Normal.

Mesenteric Glands.—All the mesenteric glands without exception were indurated and enlarged; they showed on section coarse yellowish caseous streaks forming in many of the glands an irregular network; the caseated tissue was friable and contained a fine calcareous deposit; the gland tissue between the caseous patches was firm grey and translucent. The ileo-colic glands were enlarged and on section resembled the mesenteric.

Colic Glands.—Two mid-colic glands contained a few irregular yellow caseous foci; the rest were normal.

Pancreatic Glands.—A gland lying on the pancreas showed a few foci of caseation.

Coeliac, Lumbar and Iliac Glands.—Normal.

Spleen.—Normal.

Liver showed on the surface under the capsule about three dozen tubercles ranging in size from 0·5 up to about 1·5 mm. in diameter; the larger tubercles were opaque in the centre; the smaller ones grey and translucent throughout; on section similar tubercles were sparsely scattered throughout the substance.

Portal Glands.—Normal.

Each Kidney showed on the surface a number of grey translucent foci ranging in size from a mere point to that of a mustard seed.

Suprarenal Bodies.—Normal.

Thorax:

Heart, Pleura and Diaphragm.—Normal.

Lungs.—On the dorsal surface of the right caudal lobe there were three grey tubercles, slightly opalescent in the centre, the largest about 1·5 mm. in diameter; in other parts of the lobe were seen some very minute transparent grey points. In one of the lobules in the thin posterior margin of this lobe there was a group of small firm nodules; on section these were grey and resembled gland tissue. In the left caudal lobe a few minute grey points were seen under the pleura. On section of the lungs no tubercles were seen.

Bronchial and Mediastinal Glands.—Normal.

Peripheral Lymphatic Glands.—Normal.

Microscopical Examination.

Small Intestine (opaque focus beneath small ulcer).—No T. B.

PIG 116.

Age—Fourteen weeks.

Fed with a culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

Killed—September 22nd, 1905, 112 days after.

Clinical History.

The animal remained in good health during the experiment.

Tuberculin Test.—September 20th, 1905, 110 days after the experiment began. Positive. Rise of temperature, 1·9° C.

Weights.

The animal was weighed at intervals of about a fortnight and showed a steady increase.

June 6, 1905 - - - - -	1 qr.	9 lbs.
September 22, 1905 - - - -	2 qrs.	17 lbs.
Gain in weight - - - - - -	1 qr.	10 lbs.
Rate of gain per week - - - - -		2·4 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Pharynx, and Tonsils.—Normal.

Submaxillary Glands.—One on the left side one, the size of a pigeon's egg, was caseous and softened practically throughout; in the caseous material gritty particles could be detected; the capsule of the gland was much thickened. A second gland contained a pea-sized caseous nodule.

On the right side one submaxillary gland contained a small caseating nodule.

Some glands on each side of the neck near the articulation of the jaw were normal.

Retro-Pharyngeal Glands.—Normal.

A gland the size of a marble, lying just internal to the left styloid process, was caseous throughout and softened.

The Cervical, Prescapular and Prepectoral Glands were normal.

Abdomen:

The Omentum near the spleen showed five pin-head-sized shotty grey tubercles.

Stomach.—Normal.

Small Intestine.—The long Peyer's patch showed about ten small pits in the mucous membrane (? healed ulcers); under two there was a small focus of soft whitish material, but the others showed no thickening of the base or margins; on the serous surface near the termination of the intestine were two subperitoneal tubercles; rest of intestine was normal.

Large Intestine.—Normal.

Mesenteric Glands.—Two glands in the anterior part of the mesentery contained each a collection of soft caseous material, slightly gritty, about the size of a broad bean; four others each contained a caseous tubercle the largest the size of a wheat grain. In the glands at the junction of the upper and middle thirds were two thin-walled cavities, the largest the size of a thrush's egg, filled with caseo-pus. A little further along there were three small caseous tubercles. All the glands in the lower quarter of the mesentery were enlarged and converted into cysts with thin walls and gritty caseo-purulent contents.

Ileo-colic Glands.—At the junction of the ileum and colon there was a group of glands ranging in size from a pea to a filbert; four of the larger glands were filled with soft cheesy gritty caseous material; two others were partly caseous, and two or three contained pin-head sized caseous tubercles; the rest were normal.

Colic Glands.—In the first part of the meso-colon many of the colic glands were enlarged; some were practically caseous throughout; others were partly caseous or contained small caseous nodules; the rest of the colic glands appeared normal.

On the meso-colon were several hard nodules, the largest the size of a wheat grain, with caseous centres, some softened.

The Coeliac Glands were a little enlarged and indurated and contained irregular yellowish white discrete caseous nodules, the largest the size of a wheat grain.

Glands in Small Omentum.—In this region there were eight glands, the largest the size of a filbert; two of the largest near the hilum of the liver were indurated and contained numerous yellowish caseous nodules as in the coeliac glands, beginning to soften and to become confluent in patches; all the other glands contained similar nodules which in some were confluent.

The Liver showed on the surface not very numerous discrete tubercles, ranging in size from about 0·5 to a little over 1mm. in diameter; most of the former were greyish and translucent, whilst all the latter had soft caseous centres, in some cases gritty; on the concave surface were two rather larger nodules; these had fibrous walls and soft caseous centres. On section tubercles were found distributed evenly in small numbers throughout the liver substance.

The Spleen was not enlarged and was normal on the surface; in the pulp there was one tubercle about the size of a barley grain with a soft caseous centre and three spherical pin-head sized grey tubercles slightly opaque in the centre.

Kidneys and Suprarenal Bodies.—Normal.

Thorax:

Heart and Parietal Pleura.—Normal.

The Tendon of the Diaphragm showed on its pleural surface two or three small translucent nodules and on the peritoneal surface three similar rather larger ones.

Lungs.—The lungs were filled with hard nodules irregular or angular in outline; they projected above the surface of the lung and ranged in size from a small shot up to a large pea; they were composed of dense translucent fibroid tissue which contained soft purulent foci; the nodules were mainly discrete but in three or four places near the margins several had coalesced to form irregular masses; the lung tissue between the nodules was crepitant and there were no areas of consolidation.

The Bronchial Glands were moderately enlarged and showed on section numerous more or less discrete caseous nodules ranging from 1 to 5 mm. in diameter; the gland tissue showed a great excess of interstitial connective tissue.

The Dorsal Mediastinal Glands were normal.

A Gland on the left side just within the entrance to the thorax, the size of a small marble, was caseous throughout and softened; the corresponding one on the right side contained a pin-head sized caseous tubercle.

Precrural, Superficial Inguinal, Iliac and Lumbar Glands.—Normal.

Ovaries and Uterus.—Normal.

The left ear was swollen and œdematous (recent tuberculin test).

Microscopical Examination.

Small Intestine (Purulent focus in long Peyer's patch)—No tubercle bacilli.

PIG 120. (Sow.)

Age—Two years.

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—June 2nd, 1905.

Killed—September 23rd, 1905, 113 days later.

Clinical History.

The pig remained in good health during the experiment. On August 27th, 86 days after experiment began, she gave birth to four young ones (this perhaps accounts for the loss in weight between August 8th and September 23rd).

The four young ones were not taken away from their mother and were killed when 8, 34, 74, and 85 days old respectively; they were found to be free from any sign of tuberculosis.

Tuberculin Test.—September 20th 1905. 110 days after feeding. Positive. Rise of temperature, 1·8° C.

Weights.

June 6th, 1905 - -	2 cwt.	0 qrs.	0 lbs.
June 28th, 1905 - -	2 cwt.	1 qrs.	5 lbs.
July 18th, 1905 - -	2 cwt.	2 qrs.	7 lbs.
August 8th, 1905 -	2 cwt.	2 qrs.	11 lbs.
September 23rd, 1905	2 cwt.	1 qrs.	22 lbs.

From June 6th, 1905, to August 8th, 1905, there was a steady gain in weight; during the last 46 days the pig lost 17 lbs.

Gain in weight on the initial weight, 1 qr. 22 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Tongue, Pharynx and Tonsils.—Normal.

Submaxillary Glands.—On the left side one contained a number of more or less discrete millet seed sized yellow gritty caseous tubercles; a deeper gland was slightly enlarged and contained rather larger caseous tubercles united together in places to form small irregular masses.

On the right side the glands were normal.

Retro-pharyngeal and Cervical Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Several of the Peyer's patches, chiefly in the ileum, showed some small healed ulcers under one or two of which there was slight thickening but no caseation.

Large Intestine.—Normal.

A Gastric Gland in the lesser curvature of the stomach showed scattered discrete yellowish millet seed sized tubercles.

Mesenteric Glands.—The great majority of the mesenteric glands contained irregular nodular masses, varying in size, some replacing practically the whole of the gland tissue; the caseated masses were not softened but could be readily shelled out, and had a mulberry-like outline; each was surrounded by a thin fibrous capsule which had a loculated internal surface; in the anterior part the glands were not so severely affected, several appearing normal.

Ileo-colic Glands.—At the junction of the ileum with the colon there was a group of hard glands, the largest the size of a broad bean; on section they were practically caseous throughout and resembled the mesenteric glands; the caseated tissue was slightly gritty.

Colic Glands.—Two glands on the first part of the colon were slightly enlarged and were composed practically throughout of somewhat dense gritty caseous tissue, which, as in the mesenteric glands, could easily be shelled out from a thin fibrous capsule; another gland in this region contained a pea-sized caseous nodule.

Two small mid colic glands were similarly affected and several contained calcareous grains.

Coeliac Glands.—Normal.

In the Small Omentum there were four glands not obviously enlarged which showed on section scattered throughout their substance discrete slightly gritty yellow tubercles, mostly about the size of millet seeds.

A small gland lying on the pancreas showed similar tubercles.

The Liver showed on the surface sparsely scattered tubercles ranging from a mustard seed to a millet seed; fifteen were counted on the anterior surface and six on the posterior; the larger tubercles had fibrous margins and opaque calcareous centres; some of the smaller ones were grey and translucent whilst others were slightly opaque in the centre; on section similar tubercles were very sparsely scattered throughout.

Spleen.—Normal.

The Left Kidney showed in the cortex on the surface a yellowish white nodule 2 mm. in diameter with a dark congested spot in the centre.

Right Kidney.—Normal.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Pleura and diaphragm normal.

Lungs.—In the thin posterior margin of the left caudal lobe there was a pea-sized reddish grey nodule not apparently of a tuberculous nature; otherwise the lungs were normal.

Bronchial and Mediastinal Glands.—Normal.

Precrural, Superficial Inguinal, Iliac, Lumbar, Prepectoral and Left Prescapular Glands.—Normal.

The Right Prescapular Gland was enlarged and œdematous.

The Right Ear was much swollen and on section exuded bloodstained œdema fluid (tuberculin test 72 hours previously).

The Uterus contained a litho-pœdion.

Mammary Glands (three) normal.

PIG 108.

Age—Fifteen weeks.

Fed with culture derived from the original material of Virus B. IX.

Dose—0·1 milligramme.

Date—July 10th, 1905.

Killed—October 31st, 1905, 113 days after.

Clinical History.

The animal showed no sign of illness during the experiment.

Tuberculin Test.—September 20, 1905. 71 days after the experiment began. Positive. Rise of temperature 2·2°C.

Weights.

The animal was weighed at intervals of about 14 days and showed a steady progressive increase in weight.

July 11th, 1905 - - -	1 qr. 11 lbs.
October 31st, 1905 - - -	3 qrs. 6 lbs.
Gain in weight - - -	1 qr. 23 lbs.
Rate of gain per week - -	3·2 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Tonsils showed on the surface numerous raised rounded papillae up to 2 mm. in diameter, each with a central duct; there were no scars and no sign of tubercle.

Tongue and Pharynx.—Normal.

Submaxillary Glands.—On the right side there were two, each the size of a pheasant's egg, which consisted throughout of cheesy slightly gritty caseated tissue; the capsules of the glands were thickened; on the left side there were two similarly affected glands, one the size of a pheasant's egg, the other somewhat smaller.

Pharyngeal Glands.—The left pharyngeal gland contained a firm pea-sized caseous nodule, slightly gritty from calcification. There was a similar but slightly smaller nodule in the right pharyngeal gland.

Cervical Glands.—Normal.

Thyroid Body.—Normal.

Abdomen:

The Omentum contained about a dozen firm nodules, the largest the size of a pea; these on section were yellow caseous and slightly gritty and had thin fibrous capsules.

Peritoneum.—On the cardiac end of the stomach there were three nodules similar to those in the omentum.

There were three irregular caseous nodules with thick fibrous capsules on the parietal peritoneum in the neighbourhood of the right suprarenal body.

On the peritoneum between the coils of the large intestine were numerous firm caseous nodules with fibrous capsules the largest the size of a pea.

Stomach.—Normal.

Intestines, large and small, Normal.

A Gland in the lesser curvature of the stomach was enlarged and indurated and showed on section the whole gland composed of yellow cheesy slightly gritty nodules surrounded by fibrous tissue trabeculae. A group of enlarged coeliac glands was similarly affected, the caseous nodules however being larger.

The Liver contained moderately numerous nodules, somewhat irregular in outline, ranging in size from about 1 mm. up to 4 mm. in diameter; the larger nodules had fibrous margins and caseous softened centres, slightly gritty from calcification; the smallest ones were translucent throughout.

Portal Glands (in small omentum), 7 or 8 in number, were enlarged, largest size of pigeon's egg, and consisted practically throughout of breaking down caseous material, slightly gritty from calcification, intersected by fibrous trabeculae; the capsules of the glands were thickened.

Spleen, not enlarged, showed on the surface under the capsule about 2 dozen raised yellow nodules ranging in size from a millet seed to a wheat grain; on section they extended varying distances into the pulp and were composed of softened caseous material very slightly gritty from calcification, surrounded by fibrous capsules; similar nodules were distributed throughout the pulp in small number.

Kidneys.—In the cortex of the right kidney there was a greyish white homogeneous tubercle, the size of a millet seed. The left kidney was normal.

Suprarenal Bodies.—Normal.

Thorax:

Heart and Pericardium.—Normal.

Parietal pleura.—Normal.

Diaphragm.—The tendon of the diaphragm showed on both surfaces a number of hard raised nodules, the largest the size of a small bean; they were irregular in outline and on section showed firm yellow caseous material, slightly gritty from calcification, with thick fibrous capsules; on the peritoneal surface on the right side there were two or three nodules on the muscle.

The Lungs were closely beset with hard nodules ranging in size from a pin's head to a small pea; they were somewhat irregular in outline, those under the pleura projecting above the surface: on section the smaller nodules had caseous softened slightly gritty centres and fibrous margins; the larger ones were composed of firm greyish tissue (resembling gland tissue) containing a few foci of softening in the ventral portions of the cephalic lobes and the antero-ventral of the caudal; the latter nodules were aggregated together to form masses replacing in some cases almost the whole of a lobule.

The Bronchial Glands were greatly enlarged and indurated; on section they were composed throughout of cheesy gritty caseous material intersected by fibrous trabeculae; around the gland was a thick fibrous capsule with which the trabeculae were continuous.

The Ventral Mediastinal Glands were enlarged and similarly affected.

The Mesenteric Glands not enlarged contained about a dozen widely distributed yellow caseous tubercles, gritty in the centre and varying from about 1 to 2 mm. in diameter.

The Ileo-colic Glands contained similar tubercles and one pea-sized yellow caseous nodule. One colic gland showed a pea-sized caseous nodule.

Various Lymphatic Glands:

The Right Iliac contained a firm pea-sized caseous nodule with a fibrous margin.

The Left Iliac, Lumbar, Right Superficial Inguinal, Left Precrural, Prescapular and *Left Prepectoral Glands* were normal.

A Left Superficial Inguinal Gland showed in the cortex a yellow caseous tubercle the size of a pin's head.

The Right Precrural Gland contained a pea-sized ellow caseous nodule with a fibrous margin.

A gland below the trachea near the entrance to the thorax was enlarged and caseous throughout.

The Right Prepectoral Gland contained a yellow caseous tubercle.

Microscopical Examinations(Smear Preparations).

Submaxillary Gland } No T.B.
Bronchial Gland }

GOAT 30. (She.)

Age—Adult (mother of Goat 32).

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—July 10th, 1905.

Killed—November 1st, 1905, 114 days later.

Clinical History.

The goat showed no signs of illness during the experiment.

The temperature was unaccountably high during the first three days but was practically normal throughout the rest of the experiment.

Tuberculin Test. September 20, 1905. 72 days after feeding. Positive. Rise of temperature 2·4°C.

Weights.

July 11, 1905	-	2 qrs.	6 lbs.
July 19, „	-	2 qrs.	10 lbs.
July 25 to August 8, „	-	2 qrs.	0 lbs.
October 18 „ -	-	2 qrs.	19 lbs.
November 1 „ -	-	2 qrs.	14 lbs.
Gain in weight	-		8 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Tongue, Tonsils, and Pharynx.—Normal.

Left Submaxillary Gland was enlarged to the size of a broad bean; on section the gland substance was almost entirely replaced by caseous softened nodules, the largest the size of a pea, each surrounded by a thin fibrous capsule; the caseous material was viscid and slightly gritty.

The Right Submaxillary Gland, a little smaller than the left, was similarly caseous, about three-quarters of the substance being replaced.

Left Retro-Pharyngeal Gland, size of a large broad bean, showed on section softened caseous gritty nodules collected together at one extremity into a mass; most of the gland substance was replaced.

Right Retro-Pharyngeal, slightly enlarged, contained two large pea-sized caseous nodules each surrounded by a thin fibrous capsule.

Parotid Glands.—The right parotid lymphatic gland was slightly enlarged and contained three gritty caseous softened nodules with thin fibrous capsules, largest the size of a small pea.

In the left parotid gland there was one small nodule.

Cervical Glands.—The left upper cervical gland, the size of a pea, was indurated and partly caseous.

Other cervical glands were normal.

Abdomen.

Stomach.—Normal.

Intestines, large and small.—Normal.

Gastric Glands.—Normal.

A gland attached to the first part of the duodenum contained three yellow gritty foci.

Mesenteric Glands.—A gland in the anterior part of the mesentery contained a yellow pin-head sized gritty tubercle; other mesenteric glands were normal

One Ileo-Colic Gland contained four dry cheesy gritty nodules, two the size of split peas and two much smaller.

Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—One contained in the cortex a group of three small caseous gritty tubercles.

Kidneys.—The capsules showed small milky white opacities corresponding to small pits on the surfaces of the kidneys; on radial section through these pits a grey streak was seen to extend from each throughout the whole thickness of the cortex.

Thorax.

Heart.—Normal.

Pleura.—Normal.

Lungs.—Normal in general appearance, showed in the posterior parts of the caudal lobes a few grey translucent nodules ranging up to 2 or 3 mm. in diameter; they showed no sign of central necrosis and resembled the parasitic nodules found in the lungs of other goats.

Thoracic Glands.—A mediastinal gland the size of a large pea just above the bifurcation of the trachea showed the greater part of the substance caseous and softened.

Other mediastinal glands and the bronchial glands were normal.

Prescapular, Axillary, Precrural, Popliteal, Lumbar and Iliac Glands.—Normal.

Microscopical Examination (*Smear Preparations*).

Left Retro-Pharyngeal Gland.—No T.B.

Mediastinal Gland.—No T.B.

GOAT 32.

Age—Twelve weeks.

Fed with culture derived from the original material of Virus B. IX.

Dose—1·0 milligramme.

Date—July 10th, 1905.

Killed—November 2nd, 1905, 115 days later.

Clinical History.

The goat remained in perfectly good health during the experiment.

The temperature was practically normal throughout the experiment.

Tuberculin Test.—September 20th, 1905, 72 days after feeding. Positive. Rise of temperature 2·4°C.

Weights.

July 11th, 1905	- - -	1 qr.	1 lb.
July 19th, 1905	- - -	1 qr.	4 lbs.
August 1st, 1905	- - -		26 lbs.
September 14th, 1905	- -	1 qr.	14 lbs.
October 18th, 1905	- - -	1 qr.	19 lbs.
November 2nd, 1905	- -	1 qr.	18 lbs.
Gain in weight	- - - -		17 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary Glands.—The left submaxillary gland contained a softened calcareo-caseous nodule 1·5 mm. in diameter.

In the right submaxillary gland there was a similar nodule 2 mm. in diameter.

Pharyngeal Glands.—The left retro-pharyngeal gland was enlarged and beset with discrete yellowish calcareo-caseous nodules which ranged from 1·5 to about 3 mm. in diameter.

The right retro-pharyngeal gland contained similar nodules.

Cervical Glands.—A small cervical gland, external to the right thyroid body, the size of a small pea, had a softened caseous and gritty centre.

Other cervical glands normal.

Parotid Glands.—Normal.

Abdomen :

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—The long Peyer's patch showed on the surface a few soft yellow purulent foci, the largest about 2 mm. in diameter; these could be easily scraped away with a knife, leaving in each case a shallow ulcer in the mucous membrane: the rest of the intestine was normal.

Large Intestine.—Normal.

Gastric Glands.—A precardiac gland contained a pin-head-sized yellow, very gritty tubercle: other gastric glands were normal.

Mesenteric Glands.—A gland in the anterior part of the mesentery showed in the cortex four calcareo-caseous tubercles, the size of wheat-grains, and two the size of a shot; another a little further along contained a few discrete calcareous tubercles; one near the posterior part showed small calcareous foci; the large terminal gland was closely beset with irregular yellow highly calcareous tubercles, the majority a little over 1 mm. in diameter; they easily shelled out from the gland substance.

Ileo-colic Glands.—One ileo-colic gland contained three irregular nodules, the largest the size of a pea, with thin fibrous capsules and dry cheesy gritty caseous contents; another showed in the cortex numerous yellow calcareous tubercles similar to those in the terminal mesenteric.

Colic glands.—A mid colic gland contained several yellow gritty tubercles about the size of a shot and one calcareo-caseous nodule the size of a wheat-grain: other colic glands were normal.

Spleen.—Normal.

Liver.—On the anterior surface lying in a smooth depression in the liver substance there was a yellowish-white dry chalky body, the size of a wheat-grain, loosely attached to the capsule. Substance normal on section.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies—Normal.

Thorax :

Heart.—Normal.

Pleura.—Normal.

Lungs.—The lungs were normal in general appearance; in the thin margins of each caudal lobe there were two or three greyish translucent nodules, and on the dorsal surface of each lobe a small patch, firmer than the surrounding lung tissue, of closely aggregated small grey tubercles (parasitic). In the right caudal lobe near the ventral margin there was a nodule almost the size of a broad bean, which on section showed cavities, one rather large, filled with viscid caseo-purulent material surrounded by fibrous tissue trabeculæ.

Bronchial and Mediastinal Glands.—Normal.

Lymphatic Glands.

Axillary, Prescapular, Lumbar, Iliac, Precrural, Popliteal, Gluteal and Pudic Glands were normal.

Testicles.—Normal.

Microscopical Examination (Smear Preparations.)

Pharyngeal Gland.—No T.B.

Intestine.—Two foci. No T.B. in one; a moderate number in the other.

Lung Nodule.—No T.B.

DOG 58.

Age—About six months.

Fed on July 10th, 1905 with 1·0 mg. of culture from the original material of Virus B. IX.

Initial Weight—1,100 grammes.

Final Weight—2,410 grammes.

Gain in Weight—1,310.

Killed—August 28th. 1905, 49 days after feeding.

POST-MORTEM EXAMINATION.

The Left Tonsil contained a firm caseous focus the size of a millet seed and two minute whitish specks.

Right Tonsil.—Normal.

The Left Retro-pharyngeal Gland was twice the size of the right and showed throughout its substance firm irregular greyish white patches and foci of caseation.

The Right Retro-Pharyngeal Gland and the Submaxillary and Cervical Glands were normal.

Abdomen :

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Two Peyer's patches about the middle of the intestine each showed in the lymphoid tissue two groups of minute yellow foci (two to four in each); these were visible through the peritoneum. The terminal Peyer's patch contained numerous irregular yellow foci, the largest of which were softened. The patch was not thickened and there was no ulceration of the mucous membrane.

Large Intestine.—Normal.

Mesenteric Glands.—Slightly enlarged, showed through the capsules irregular patches and foci of caseation; on section the patches and foci were situated in the cortices and were opaque white firm and very irregular in outline; the terminal gland was most affected, the caseous areas being very large.

An Ileo-colic Gland showed similar patches of caseation, but was not enlarged.

Spleen, Liver, Kidneys and Suprarenal Bodies were normal.

Portal Gland.—Normal

Lungs.—The right cephalic lobe showed on the dorsal surface under the pleura a hard grey tubercle about 2 mm. in diameter, with a soft white centre. On the dorsal surface of the left caudal lobe there was a similar tubercle. Lungs elsewhere normal.

The Right Praetracheo-bronchial Gland, not enlarged, showed in the cortex small irregular patches of early caseation.

An Intertracheo-Bronchial Gland on the left side contained a few similar patches.

Other Bronchial Glands were normal.

Coeliac, Lumbar and Iliac Glands.—Normal.

Microscopical Examination.

Three Foci from Small Intestine.—Numerous T.B. in all.

Left Tonsil { *Caseous Focus.*—T. B.
Opaque Speck.—No T. B.

Mesenteric Gland.—Numerous T. B.

Spleen.—No T. B.

Lung Tubercle.—Several beaded T. B.

Bronchial Gland.—Numerous T. B.

DOG 62.

Age—About 1 year.

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Killed—August 28th, 1905, after 49 days.

POST-MORTEM EXAMINATION.

Tonsils and Intestines.—Normal.

Pharyngeal, Submaxillary and Mesenteric Glands were normal.

All other Lymphatic Glands and all the organs were normal to the eye.

Microscopical.

Paraffin sections of a mesenteric gland showed nothing of a tuberculous nature.

DOG 52.

Fed on June 2nd, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Age—Two days.

Died—August 12th, 1905.

Duration of Experiment—Seventy-one days.

POST-MORTEM EXAMINATION.

There was a greyish focus in each retro-pharyngeal gland.

The Small Intestines contained numerous round worms; otherwise they were normal.

Mesenteric and *Colic Glands* normal.

Other Lymphatic Glands and all the organs were normal.

Microscopical.

Pharyngeal Gland.—Moderately numerous T. B.

Mesenteric Gland.—No T. B.

Colic Gland.—No T. B.

DOG 50.

Fed on June 2nd, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Killed—September 21st, 1905, 111 days after feeding.

Clinical History.

There was no sign of illness during the experiment.

Tuberculin Test.—September 9th, 1905. Positive. Rise of temperature 1·2° C. (Maximum 39.8 at the ninth hour). Dose of tuberculin 5·0 c.c.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Retro-Pharyngeal and Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric and Colic Glands.—Normal.

Lungs.—The left cephalic lobe was almost entirely consolidated and was slightly adherent to the chest wall at the apex; it was firm greyish and somewhat translucent with no opaque areas and showed near the apex a small loculated cavity containing a small quantity of yellow pus. The rest of the lung was normal.

The left bronchial gland was larger than the right, but there was no sign of caseation or necrosis.

Spleen, Liver and Portal Gland.—Normal.

Each Kidney showed in the cortex a few opaque white spherical tubercles, the size of small pin's heads; they easily shelled out and were of a soft consistency, but had not broken down. (These were not apparently of a tuberculous nature.)

Other Organs and Glands were normal.

Microscopical.

Kidney Tubercle.—No tubercle bacilli were found; the smear showed numerous polynuclear cells and a few large alveolar cells.

Pus from cavity.—Very numerous tubercle bacilli, many in clumps and very beaded.

Emulsion of solid Lung.—No. T. B.

Animals Inoculated.

Guinea-pig 1707, inoculated intraperitoneally with emulsion of consolidated lung, died in 30 days of general tuberculosis.

Guinea-pig 1708, inoculated intraperitoneally with pus from cavity, died in 26 days of general tuberculosis.

Cultures were obtained from both the above guinea-pigs.

DOG 60.

Age—About six months

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Initial Weight—1,270 grammes.

Final Weight—5,440 grammes.

Gain in Weight—4,170 „

Tuberculin Test—September 20th, 1905. Negative. Dose of tuberculin, 2·0 cc

Killed—October 30th, 1905.

Duration of Experiment—112 days.

POST-MORTEM EXAMINATION.

Tongue, Tonsils and Pharynx.—Normal.

The Pharyngeal Glands were not enlarged; the right contained three irregular chalky white foci, slightly gritty from calcification, none larger than a pin's head; the left was normal.

Abdomen :

Omentum and Peritoneum.—Normal.

Stomach and Intestine.—Normal.

The Mesenteric Glands were not obviously enlarged; three or four showed through the peritoneum opaque yellowish nodules, varying in size from 0·5 to 2 mm. in diameter; on section they were situated wholly in the cortex and were dense yellowish-white irregular in outline and sharply differentiated from the surrounding gland substance; some showed in the centre fine calcareous deposit.

The Ileo-colic Gland contained two small irregular opaque tubercles.

Rectal Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Lungs.—Normal.

Portal, Bronchial, Iliac, Prescapular and Axillary Glands.—Normal.

Microscopical.

Mesenteric Gland.—(*a*) Numerous T. B.; (*b*) A few T.B.

Ileo-colic Gland.—No. T. B.

A guinea-pig inoculated intraperitoneally with an emulsion from a mesenteric gland died in 33 days and showed tuberculosis of a mild type.

DOG 64.

Age—About 1 year.

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus IX.

Tuberculin Test—September 20th, 1905. Negative. Dose of tuberculin, 5·0 cc.

Killed—October 28th, 1905.

Duration of Experiment—110 days.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Intestines.—Normal.

Retro-Pharyngeal, Cervical and Mesenteric Glands.—Normal.

The Ileo-colic Gland showed a patch of congestion, but no foci of caseation.

Spleen, Liver and Kidneys.—Normal.

Portal Gland.—Normal.

Lungs.—In one caudal lobe there was a grey tubercle, a little larger than a millet seed, with a slightly opaque centre; otherwise the lungs were normal.

Bronchial Glands.—Normal.

Microscopical.

Lung Tubercle.—No T.B.

CAT 48. (Kitten, 11 weeks old.)

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Killed—August 26th, 1905.

Duration of Experiment—47 days.

POST-MORTEM EXAMINATION.

Tongue, Tonsils and Pharynx.—Normal.

The Left Retro-Pharyngeal Gland, not enlarged, showed a small group of caseous foci in one part of the cortex.

The Right Retro-Pharyngeal Gland, the *submaxillary* and the *cervical glands* were normal.

Abdomen :

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Five Peyer's patches were somewhat enlarged and showed on the mucous surface each a number of irregular congested ulcers; on section the lymphoid tissue at the base and around the margins was caseous; there were no subperitoneal tubercles.

The mucous membrane of the intestine, chiefly that of the ileum, showed numerous minute ulcers, seen as reddish spots on the surface; on section the sub-mucous tissue under and around them was caseous.

Large Intestine.—Normal.

Pyloric Gland.—Normal.

The Mesenteric Glands were all enlarged and indurated; on section they showed numerous yellowish-white caseous patches of various sizes, in some of the glands replacing almost the whole of the cortex.

An Ileo-Colic Gland contained two or three caseous foci.

Colic Gland.—Normal.

Spleen.—Not enlarged; on section the Malpighian corpuscles were conspicuous as spherical grey bodies, the size of pins' heads; there was no sign of central necrosis in any of them.

Liver.—Normal.

Portal Gland.—Normal.

Kidneys.—Normal.

Heart and Pleura.—Normal.

Lungs.—On the dorsal surface of the right cephalic lobe there was a slightly raised greyish yellow patch about 5 mm. in diameter; this on section extended into the lung substance as a solid wedge; the mass was firm and caseous and surrounded by a grey translucent zone. In other parts of the lungs, chiefly in the caudal lobes under the pleura, were seen grey foci, some barely visible to the eye, resembling early tubercles.

Bronchial Glands.—The gland lying in front of the right bronchus was slightly enlarged and showed several small caseous nodules in the cortex.

Other bronchial glands were normal.

Microscopical Examination.

Retro-Pharyngeal Gland.—Numerous T.B.
Caseous Mass in Lung.—Numerous T.B.
Grey focus in Lung.—Several T.B. found.
Spleen (Malpighian body).—Two T.B.

CAT 50. (Kitten–Age 11 weeks.)

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Tuberculin Test—September 20th, 1905. Negative. Dose of tuberculin 1·0 cc.

Killed—September 22nd, 1905.

Duration of Experiment—74 days.

POST-MORTEM EXAMINATION.

Tongue, Tonsils and Pharynx.—Normal.

The Right Retropharyngeal Gland contained one firm white tubercle about twice the size of a mustard seed.

The Left Pharyngeal Gland was slightly enlarged and showed in the cortex about half-a-dozen firm whitish nodules, the largest the size of a wheat grain.

Submaxillary and Cervical Glands.—Normal.

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—In the lower part of the ileum there was a large area of ulceration 6 in. in length; the mucous membrane of this part of the bowel had completely disappeared with the exception of a long narrow strip, the margins of which were serpiginous whitish and slightly proliferated; at each end of the large ulcer the mucous membrane showed a few small isolated ulcers; there was no thickening of the wall of the intestine in these regions.

The Peyer's patches were normal. There was no sign of tuberculosis anywhere.

Large Intestine.—Normal.

The Mesenteric Glands were a little enlarged and showed in the cortices milky white firm caseous areas, irregular in size and outline.

One Ileo-Colic Gland contained a pin-head sized caseous focus.

Colic Gland.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Gland.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax:

Heart and Pleura.—Normal.

Lungs.—The right cephalic lobe showed a patch of collapse, otherwise the lungs were crepitant throughout; they contained moderately numerous grey shotty tubercles, all remaining discrete; some of the tubercles were homogeneous throughout, but the majority had minute opaque white caseous centres.

Bronchial and Mediastinal Glands.—Normal.

Lumbar, Iliac and Prescapular Glands.—Normal.

Microscopical.

Mesenteric Gland.—Numerous T.B.
Lung.—A few T.B.
Spleen.—No T.B.

CAT 52. (Kitten—Age 11 weeks.)

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Tuberculin Test—September 20th, 1905. Positive. Rise of Temperature 1·1° C. Dose of tuberculin 1.0 cc.

Killed.—November 8th, 1905.

Duration of Experiment—121 days.

POST-MORTEM EXAMINATION.

Tongue, Tonsils, and Pharynx.—Normal.

The Right Retropharyngeal Gland showed in the cortex at one extremity a number of hard white caseous nodules, slightly gritty from calcification.

The Left Pharyngeal Gland contained two chalky white tubercles, the largest the size of a millet seed.

Submental, Submaxillary and Cervical Glands.—Normal

Abdomen:

Omentum and Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Normal.

Large Intestine.—Normal.

Mesenteric Glands were slightly enlarged and showed calcareo-caseous areas of various sizes in the cortex. In the cortex of one of these glands there was a thin sheet of calcareo-caseous material separated from the capsule of the gland by a thin layer of normal gland tissue.

The Ileo-Colic Gland showed in the cortex an irregular thin calcareo-caseous patch over which the capsule of the gland was puckered and scarred

Ileo-coecal and Colic Glands were normal.

The Spleen was not enlarged; on the surface there were three or four rounded eminences in the centre of two of which the capsule showed a minute whitish point; on section these areas were a little firmer and perhaps paler than the surrounding spleen tissue, but there was no sign of caseation or necrosis.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax:

Heart and Pleura.—Normal.

Lungs.—The lungs were firmer and fuller than normal; they showed on the surface, particularly in the caudal lobes, grey translucent patches, irregular in outline, composed of confluent grey tubercles; between the patches there were a few discrete tubercles; on section similar patches and tubercles were seen in the depth of the lung, diffusely infiltrating the lung substance; there was no definite caseation, but some of the tubercles showed signs of commencing necrosis.

The Bronchial Glands appeared a little enlarged; no caseous foci were visible.

Microscopical.

Calcareo-caseous Nodule in Ileo-colic Gland.—Numerous T.B.

A culture was obtained from the ileo-colic gland.

CAT 46. (Age 2 years.)

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Killed.—August 27th, 1905.

Duration of Experiment.—48 days.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal, and Cervical Glands.—Normal.

Abdomen :

Omentum and Peritoneum.—Normal.
Stomach and Intestines.—Normal.
Mesenteric Glands.—Normal, with the exception of a small one in the terminal part of the mesentery which contained a minute whitish point.

The Ileo-colic Gland showed in the centre a small caseating tubercle.
Colic Glands.—Normal.
Spleen.—Normal.
Liver.—Normal.
Kidneys.—Normal.
Lungs.—Normal.
Bronchial Glands.—Normal.

Microscopical Examination.

Mesenteric Gland Focus.—One tubercle bacillus.
Ileo-colic Gland Tubercle.—A few tubercle bacilli.

CAT 38. (Young Adult.)

Fed on June 2nd, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Tuberculin Test.—September 20th, 1905. Positive. Rise of Temperature 1·7° C. Dose of tuberculin 2·0 c.c.

Killed.—September 21st, 1905.

Duration of Experiment.—111 days.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.
Submaxillary and Pharyngeal Glands.—Normal.

Abdomen :
Stomach and Intestines.—Normal.
Mesenteric Glands.—A terminal mesenteric gland contained a firm whitish caseous tubercle, irregular in outline, about the size of a pin's head. Other mesenteric glands were normal.
Ileo-colic Glands.—Normal.
Colic Glands.—Normal.
Liver, Spleen, Kidneys and Suprarenal Bodies.—Normal.
Portal Gland.—Normal.

Thorax :
Heart and Pleura.—Normal.
Lungs.—The right caudal lobe showed under the pleura a grey quite transparent body, less than a pin's head in size; lungs otherwise perfectly normal.

Microscopical.

Tubercle in Mesenteric Gland.—A few T.B.
Tubercle from Lung.—No T.B.

MONGOOSE 8.

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Died.—August 15th, 1905, 36 days after feeding.

POST-MORTEM EXAMINATION.

The Abdomen was a little distended. The peritoneal cavity contained foul smelling turbid fluid, and on the peritoneum were deposited a few shreds of lymph.

In the wall of the duodenum, a quarter of an inch from the pylorus, there was a small perforation, the margins of which were slightly hæmorrhagic ; there was no surrounding thickening.

Nothing of a tuberculous nature was seen in any of the organs or glands.

Microscopical.

Peritoneal Fluid.—Numerous cocci and long thick bacilli stained blue ; no tubercle bacilli.
Duodenal ulcer.—No tubercle bacilli.
Mesenteric Gland }
Spleen } No T.B.

MONGOOSE 10.

Fed on July 10th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Died.—July 31st, 1905, 21 days after feeding.

POST-MORTEM EXAMINATION.

Animal thin; no subcutaneous fat.

The mucous membrane of the stomach showed about twelve small circular ulcers, the largest 2 mm. in diameter ; these had sharply cut edges outlined by a line of altered blood. The stomach was empty. The intestines were almost empty. Mucous membrane normal. Other organ and all the lymphatic glands appeared normal.

Microscopical.

No tubercle bacilli were found in two smears from the mesenteric glands, or in the smears from the gastric ulcer, spleen, liver, kidney and lung.

MONGOOSE 12.

Fed on September 11th, 1905, with 1·0 mg. of culture from the original material of Virus B. IX.

Died.—October 16th, 1905, 35 days after feeding.

POST-MORTEM EXAMINATION.

Tonsils and Pharynx.—Normal.

Pharyngeal Glands.—Normal.

The Right Submaxillary Gland showed two small patches of caseation in the cortex.

The Left Submaxillary Gland was normal.

Stomach.—The mucous membrane of the stomach showed numerous small ulcers or erosions; some of these penetrated to the muscular coat, but did not involve it; in the bases of several bleeding points were seen from which recent hæmorrhage had taken place.

The Small Intestines were filled with altered blood; the mucous membrane was normal.

Gastric, Mesenteric, Ileo-colic and Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Gland.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Lungs.—In the left caudal lobe near the dorsal surface there was a solid nodule, the size of a small bean, composed of translucent grey tissue speckled with yellow foci. The rest of the lungs were normal except for a number of pea-sized parasitic cysts.

Bronchial Glands.—The glands on the left side were enlarged; one in front of the bronchus showed the greater part of its substance firm yellow and caseous; the one posterior to the bronchus (intertracheo-bronchial) was caseous throughout. Other bronchial glands were normal.

Pleura and Peritoneum.—Normal.

Microscopical.

Submaxillary Gland.—A few T.B.

Lung Nodule.—Numerous T.B.

MONGOOSE 14.

Fed on September 11th, 1905, with 1 mg. of culture from the original material of Virus B. IX.

Died.—On November 9th, 1905, 59 days after.

POST-MORTEM EXAMINATION.

Tonsils and Pharyngeal Mucous Membrane.—Normal.

The Left Submaxillary Gland was slightly enlarged and contained three irregular caseous tubercles.

The Right Submaxillary Gland was similarly affected.

The Left Retropharyngeal Gland contained three or four tubercles similar to those in the submaxillary glands.

Right Retropharyngeal Gland.—Normal.

Abdomen:

The Omentum contained two minute pearly tubercles.

Stomach.—The mucous membrane showed numerous small ulcers; at the base of one there was a bleeding point.

Intestines.—The contents of the large and small intestines were black (altered blood); the Peyer's patches in the small intestine contained minute yellow foci which were visible only from the peritoneal surface; there was no ulceration.

The Mesenteric Glands, ? enlarged, showed in the cortex scattered soft yellow foci, the size of pins' heads.

Gastric and Colic Glands.—Normal.

The Ileo-cæcal Gland contained two soft yellow tubercles, the size of millet seeds.

The Spleen was slightly enlarged; on the surface at one extremity there were a few grey pin-point foci; in the pulp there were about half-a-dozen firm nodules, the largest about 5 mm. in diameter; on section they were reddish in colour but paler than the surrounding spleen pulp; the largest one was yellow and necrotic in the centre.

The Liver showed numerous translucent grey tubercles, the largest the size of a pin's head.

Portal Gland.—Normal.

Kidneys.—Normal.

Thorax:

Pleura, Diaphragm and Heart.—Normal.

Lungs.—The left cephalic lobe contained two firm grey nodules, each the size of a split pea, slightly yellow in the centre; in the rest of the lung there were two pin-head sized grey tubercles.

Bronchial Glands.—Normal.

Microscopical.

No tubercle bacilli were found in any of the lesions. A culture of the tubercle bacillus was obtained from the mesenteric gland.

GUINEA-PIG 1621.

Fed on July 10th, 1905, with 0·1 mg. of culture from Virus B. IX.

Initial Weight.—330 grammes.

Final Weight.—430 grammes.

Gain in Weight.—100 grammes.

Killed.—August 28th, 49 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

The Submental Glands, the size of peas, were caseous and softened throughout; a left mid-cervical gland contained a caseous nodule 5 mm. in diameter.

Small Intestine.—The early part of the ileum showed a caseous ulcerated patch 5 mm. in diameter; rest of intestine normal.

The Mesenteric Glands showed irregular caseous patches replacing about half the substance.

The Ileo-colic and Colic Glands were normal.

Spleen contained three caseating nodules, with mulberry like outline, 5 to 6 mm. in diameter.

In the Liver there was one doubtful grey point.

The Portal Gland contained two caseous nodules, each about 5 mm. in diameter.

Lungs.—In the right caudal lobe there was one miliary grey tubercle with a caseous centre.

Bronchial Glands were much enlarged and adherent to each other; those on the right side were caseous throughout and partly softened; those on the left showed irregular caseous patches; other organs and glands, normal.

Microscopical Examination.

T.B. found in lung tubercle; none in grey focus in liver, but numerous other organisms stained blue.

GUINEA-PIG 1622.

Fed on July 10th, 1905, with 0·1 mg. of culture of Virus B. IX.

Initial Weight.—370 grammes.

Final Weight.—380 grammes.

Gain in Weight.—10 grammes.

Killed.—November 8th, 121 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

Glands of Head and Neck.—Normal.

The Omentum contained two fibrous nodules with caseous centres.

Intestines.—Normal.

Two Glands near the Pylorus were enlarged to the size of peas; one was composed of fibroid tissue containing a few minute opaque points; the other had a thick fibrous capsule and soft caseous centre.

The Posterior Mesenteric Gland was dense fibroid and contained a cavity filled with thin whitish pus.

The Spleen contained three caseating nodules, largest 2·5 mm. in diameter.

Liver.—(No note made).

Portal Gland.—Enlarged, composed of fibroid tissue containing yellow streaks and foci of necrosis. The cœliac gland, the size of a pea, had a thick fibrous margin and purulent centre. One lumbar gland was slightly enlarged and fibroid.

Lungs contained about 15 caseous tubercles with grey margins 1 to 2 mm. in diameter.

Bronchial Glands were enlarged and fibroid and showed minute foci of necrosis.

GUINEA-PIG 1562.

Fed January 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—290 grammes.

Final Weight.—250 grammes.

Loss in Weight.—40 grammes.

Died.—June 30th, 128 days after feeding.

POST-MORTEM EXAMINATION.

Small Intestine.—Five Peyer's patches contained each a soft caseous nodule; they ranged in size from a pin's head to a split pea; the mucous membrane over some showed signs of beginning ulceration.

Large Intestine.—Three lymphoid patches in the cortex showed irregular yellow caseous patches (3 mm. in diameter); the mucous membrane over them was congested and beginning to ulcerate.

Mesenteric Glands.—Enlarged, showed irregular opaque caseous areas in the cortex; the posterior gland was most affected. The ileo-colic glands showed caseous and softened nodules replacing about a third of the substance.

Liver, Spleen, Lungs and Kidneys.—Normal.

Right Bronchial Gland.—Contained an opaque caseous nodule 3 mm. in diameter; other lymphatic glands were normal.

GUINEA-PIG 1564.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—530 grammes.

Final Weight.—320 grammes.

Loss in Weight.—210 grammes.

Died.—July 2nd, 30 days after feeding.

POST-MORTEM EXAMINATION.

Small Intestine.—A Peyer's patch 12 in. from the ileo-cœcal valve showed in the substance a caseous patch 2 mm. in diameter.

Mesenteric Glands.—The terminal gland contained a caseous tubercle about 1 mm. in diameter.

Other Glands and all Organs.—Normal.

GUINEA-PIG 1560.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—670 grammes.

Final Weight.—500 grammes.

Loss in Weight.—170 grammes.

Died.—July 10th, 38 days after feeding.

POST-MORTEM EXAMINATION.

Pharyngeal Mucous Membrane and Glands of Head and Neck.—Normal.

Small Intestines.—The terminal Peyer's patch was enlarged and caseous practically throughout; the mucous membrane was not ulcerated.

Large Intestine.—The colon at its junction with the cœcum showed a soft caseous area in the wall with a small ulcer on the mucous surface.

Mesenteric Glands.—The anterior mesenteric glands were normal. A mid-mesenteric was enlarged and caseous throughout; the terminal gland was enlarged and more than three-quarters caseous and beginning to soften.

The Ileo-colic Glands were enlarged and caseous practically throughout.

The Spleen, enlarged, showed enlargement of the Malpighian bodies without central necrosis.

The Liver was pale and contained a few doubtful yellow foci. The portal gland showed the whole of the cortex caseous.

Kidneys, Suprarenal Bodies.—Normal.

Lungs.—In each cephalic lobe there was a grey tubercle 1·5 mm. in diameter with a soft caseous centre.

The Bronchial Glands were much enlarged and practically caseous throughout.

Other Lymphatic Glands.—Normal.

Microscopical Examination.

Liver.—No T.B.

Spleen and Lung.—Numerous T.B.

GUINEA-PIG 1566.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—280 grammes.

Final Weight.—270 grammes.

Loss in Weight.—10 grammes.

Died.—July 10th, 38 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx and Glands of Head and Neck.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The terminal gland, the size of a large pea, was more than two-thirds dense and caseous.

Colic Glands.—One was slightly enlarged and showed early caseation.

Spleen.—Was not enlarged; some of the Malpighian bodies were enlarged, but not opaque.

Liver.—Showed two minute yellow specks under the capsule.

Lungs.—In the right caudal lobe there was a small grey tubercle. Other organs and glands normal.

Microscopical Examination.

A few tubercle bacilli were found in the liver and lung. Numerous tubercle bacilli in the spleen.

GUINEA-PIG 1567.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—250 grammes.

Final Weight.—190 grammes.

Loss in Weight.—60 grammes.

Died.—July 14th, 42 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

Neck Glands.—Submental and submaxillary glands enlarged and partly caseous; each cervical gland contained two caseous nodules, the largest 2 mm. in diameter.

Intestines.—A Peyer's patch, two inches from the pylorus, contained a soft caseous patch 2 mm. in diameter.

Some of the lymphoid patches in the colon showed irregular caseous foci.

A gland near the pylorus, the size of a pea, was firm and three-quarters caseous.

Mesenteric Glands.—Two in the posterior part of mesentery were enlarged and showed the greater part of the cortex caseous; the others were not obviously affected.

Ileo-colic Glands.—On each side of the junction of small and large intestines there was an enlarged and partly caseous gland.

Colic Glands.—Normal.

Spleen.—A little enlarged, contained numerous irregular caseous tubercles, some confluent.

Liver.—Showed fairly numerous yellowish foci.

Portal and Bronchial Glands.—Extensively caseous.

Lungs.—Showed patches of consolidation but no tubercles.

Microscopical Examination.

No tubercle bacilli found in liver. A few in the nodule from small intestine.

GUINEA-PIG 1619.

Fed July 10th, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—400 grammes.

Final Weight.—250 grammes.

Loss in Weight.—150 grammes.

Died.—August 21st, 42 days after feeding.

POSTMORTEM EXAMINATION.

Pharynx.—Normal.

Each Submaxillary Gland contained a caseous focus.

Two Glands in the Posterior Triangle contained soft caseous nodules.

Small Intestine.—There was a pin-head-sized caseous focus under the mucous membrane near the pylorus; near the ileo-coecal valve there was another large caseous focus; there was no ulceration.

Large Intestine.—The wall of the coecum showed a caseous nodule not ulcerated.

Colon.—Normal.

Pyloric Gland contained a small tubercle.

Mesenteric Glands.—One anterior gland contained two opaque foci. The cortex of the posterior one was opaque, yellow and caseous; the rest were normal.

Each ileo-colic gland contained a single yellow focus and a colic gland two caseous foci.

Spleen.—Enlarged (1¾ by ¾ by ⅛ inches) contained irregular caseo necrotic masses, replacing a considerable part of its substance.

Liver was beset with irregular bile stained patches of necrosis.

Portal Gland.—Large and caseous throughout. Coeliac gland partly caseous.

Lungs.—Right cephalic and middle lobes were adherent to each other and to a mass of glands around the bronchus· the cephalic lobe was wholly caseous and softened in the centre. The middle lobe was collapsed and airless and contained a yellow caseous nodule and numerous minute opaque grey tubercles; in the right caudal lobe there were two small areas of collapse and a yellow caseous mass surrounding the bronchus at its entrance into the lung. The left lobes were crepitant and showed a moderate number of discrete tubercles with opaque centres.

The Bronchial Glands were much enlarged, fused together and caseous throughout.

The Inguinal, Axillary and Lumbar Glands contained each a caseous tubercle.

GUINEA-PIG 1563.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—310 grammes.

Final Weight.—190 grammes.

Loss in Weight.—120 grammes.

Died.—July 15th, 43 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

A Mid-cervical Gland on each side contained pin-head-sized caseous tubercles.

Small Intestine.—One Peyer's patch showed minute yellow points; there was no ulceration.

Mesenteric Glands.—Three were enlarged and showed their cortices partly caseous.

One Ileo-Colic Gland contained a soft caseous nodule and minute opaque points in the cortex.

Spleen.—A little enlarged, contained fairly numerous opaque miliary tubercles.

The Liver.—Showed scattered irregular yellow areas of necrosis.

The Portal Gland showed early caseous foci in the cortex.

Kidney and Heart.—Normal.

Lungs.—Contained four translucent tubercles.

Lumbar Glands.—Partly caseous.

The Inguinal and Axillary Glands on left side contained small opaque foci.

Other Lymphatic Glands.—Normal.

GUINEA-PIG 1565.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—460 grammes.

Final Weight.—300 grammes.

Loss in Weight.—160 grammes.

Died.—July 19th, 47 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

Submental, Submaxillary and Cervical Glands were slightly enlarged and contained discrete tubercles ranging in size from a millet seed to a wheat grain.

Small Intestine.—A Peyer's patch near the end of the ileum was slightly caseous.

Large Intestine.—In a lymphoid patch at the beginning of the colon there was some yellow foci.

A Duodenal Gland contained a minute whitish point.

Mesenteric Glands.—The terminal gland was enlarged and showed more than half its cortex caseous; the rest were normal.

The Ileo-Colic Gland.—The size of a pea, was three-quarters caseous. The ileo-coecal gland showed caseous foci. Colic glands normal.

Spleen.—Slightly enlarged, was beset with irregular millet seed sized caseating tubercles.

The Liver contained numerous small irregular bile stained areas of necrosis.

The Portal Gland was enlarged and extensively caseated.

The Lungs contained two or three small grey tubercles.

The Left Inguinal Gland contained a small caseous tubercle.

GUINEA-PIG 1561.

Fed June 2nd, 1905, with 1·0 mg. culture of Virus B. IX.

Initial Weight.—420 grammes.

Final Weight.—300 grammes.

Loss in Weight.—120 grammes.

Died.—July 24th, 1905, 52 days after feeding.

POST-MORTEM EXAMINATION.

Pharynx.—Normal.

Right Submaxillary Gland.—Enlarged and caseous throughout.

Left Submaxillary Gland.—Contained three opaque foci; the cervical glands showed small caseous areas in the cortex.

Small Intestine.—Two Peyer's patches were caseous and ulcerated on the mucous surface.

Large Intestine.—The colon at its junction with the ileum showed a patch the size almost of a threepenny piece, containing numerous yellow foci without ulceration.

The Mesenteric Glands. four in number, and the ileo-colic glands were enlarged and their substance almost entirely replaced by caseous deposit beginning to soften.

Spleen.—A little enlarged, contained twelve caseating miliary tubercles.

Liver.—Showed scattered yellow necrotic foci.

Kidneys.—Normal.

Lungs.—Right cephalic lobe, collapsed, contained two hard fibrous tubercles; the rest of the lungs showed patches of congestion but no tubercles.

Bronchial Glands.—Greatly enlarged and caseous throughout.

Ventral Mediastinal Glands.—Partly caseous.

One Lumbar Gland contained an opaque point.

Other Lymphatic Glands.—Normal.

Microscopical Examination.

Lung.—No tubercle bacilli.

GUINEA-PIG 1620.

Fed on July 10th, 1905, with 1·0 mg. of culture of Virus B. IX.

Initial Weight.—330 grammes.

Final Weight.—200 grammes.

Loss in Weight.—130 grammes.

Died.—September 12th, 64 days after feeding.

POST-MORTEM EXAMINATION.

Small Intestine.—Eighteen inches from the pylorus the wall of intestine showed a flat caseous nodule 5 mm. in diameter; the nodule was softened in the centre and showed on the mucous surface two or three small ulcers.

Three Mesenteric Glands, and two Ileo-Colic Glands, and the Left Submental Gland were large and firm and practically caseous throughout.

The Mid-cervical Glands contained pin-head sized caseous tubercles.

Spleen.—Three times the normal, was closely beset with irregular caseous tubercles confluent around the margins.

The Liver showed several pale fibroid areas and a number of irregular canary yellow patches of necrosis.

Portal Gland.—Partly caseous.

Kidneys.—There were four miliary caseous tubercles in the right and two in the left kidney.

The Cœliac and Lumbar Glands contained each a caseous tubercle.

The Lungs contained numerous discrete miliary tubercles with caseous centres and grey margins; the ventral part of left cephalic lobe was firm and completely caseous.

The Bronchial Glands were caseous throughout and partly softened.

The Ventral Mediastinal Glands were partly caseous. No tuberculosis elsewhere.

RABBIT 301.

Fed on June 2nd, 1905, with 1·0 mg. of culture of Virus B. IX.

Died.—June 5th, 1905, 3 days later.

RABBIT 302.

Fed on June 2nd, 1905, with 1·0 mg. of culture of Virus B. IX.

Initial Weight.—1,770 grammes.

Final Weight.—2,900 grammes.

Gain in Weight.—1,130 grammes.

Killed.—September 21st, 1905, 111 days after feeding.

POST-MORTEM EXAMINATION.

Glands of Head and Neck.—Normal.

Small Intestine.—The dilated end of the ileum and the vermiform appendix showed several follicles filled with secretion; otherwise the intestines were quite normal.

Mesenteric Glands.—The posterior gland contained a collection of whitish caseo-pus, 2 mm. in diameter.

Lungs.—The right lung showed one tubercle 1·5 mm. in diameter with a caseous centre and three smaller grey tubercles; there was one grey tubercle in the left lung.

Other organs and glands were normal.

Microscopical.

Secretion from Follicle.—No T. B.

Mesenteric Gland.—A few T. B.

Lung.—A few T. B.

RABBIT 303.

Fed on June 2nd, 1905, with 1·0 mg. of culture of Virus B. IX.

Initial Weight.—420 grammes.

Final Weight.—540 grammes.

Gain in Weight.—120 grammes.

Killed.—July 20th, 1905, 48 days after feeding.

POST-MORTEM EXAMINATION.

Small Intestine.—The dilated end of the ileum showed in its lymphoid tissue just under the peritoneum about thirty caseous foci; there was no ulceration internally.

The Appendix was swollen at its extremity for about 1½ in. and showed under the peritoneum a complete thin layer of caseous deposit; the mucous membrane over it was not ulcerated. There were several caseous nodules in the coccum.

The Right Submaxillary Gland was partly caseous; *the Right Cervical* contained an irregular caseous patch.

Mesenteric Glands.—The margins of five were caseous, about half the cortex being affected in each case.

Lungs.—The lungs contained thirteen caseating nodules ranging in size from a pin's head to a small pea.

The Bronchial Glands were small, but showed caseous foci in the cortex.

The Ventral Mediastinal Glands contained small opaque tubercles.

The Spleen showed two grey tubercles along one margin, projecting slightly under the capsule.

Liver.—Normal. Portal gland, small, contained one opaque point.

The Right Kidney showed one small grey tubercle.

Other organs and glands were normal.

Microscopical.

Kidney.—T.B. fairly numerous.

Spleen (2 *smears*).—T. B. fairly numerous.

RABBIT 304.

Fed on June 2nd, 1905, with 1·0 mg. of culture of Virus B. IX.

Initial Weight.—530 grammes.

Final Weight.—540 grammes.

Gain in Weight.—10 grammes.

Killed.—August 22nd, 1905, 81 days after.

POST-MORTEM EXAMINATION.

Left Tonsil.—Enlarged, caseous and ulcerated.

Right Tonsil and Pharyngeal Mucous Membrane.—Normal.

Small Intestine.—A little beyond the middle of the intestine there was an irregular ulcer, about 8 mm. in diameter, with raised irregular undermined margins and thick caseous base; the latter projected considerably from the serous surface. The terminal dilated portion of the ileum showed in the lymphoid tissue just under the peritoneum numerous soft caseous nodules the mucous membrane over which in a few cases was ulcerated.

The Vermiform Appendix showed numerous similar nodules; over one of these there was a small congested ulcer in the mucous membrane.

The Right Submaxillary (*two*) *and the Superior Cervical Glands* were enlarged and caseous throughout. The left prepectoral and left axillary glands were slightly enlarged and almost completely caseous.

The Mesenteric Glands were slightly enlarged and showed in the cortices white patches and foci of caseation; in several of the glands the caseous areas replaced almost the whole of the cortex.

The Lungs collapsed badly and contained large firm caseous masses, irregular in outline, occupying about half the whole bulk of the lung; in the crepitant parts of the lung between the masses there were scattered pinhead-sized tubercles with opaque centres.

Bronchial Glands.—Enlarged and partly caseous.

The Spleen contained one millet-seed-sized caseous tubercle.

The Liver substance showed numerous minute grey foci. Portal gland normal.

The Kidneys showed numerous grey tubercles in the cortex; the majority of these were small grey and translucent, but a few were larger and caseous in the centre.

There were two flattened caseous tubercles on the costal pleura.

Microscopical.

A few T.B. found in the liver.

RABBIT 345.

Fed on July 10th, 1905, with 1 mg. of culture of Virus B. IX

Initial Weight.—1,960 grammes.

Final Weight.—2,320 grammes.

Gain in Weight.—360 grammes.

Killed.—September 3rd, 1905, 55 days later.

POST-MORTEM EXAMINATION.

Small Intestine.—The terminal dilated portion of the ileum showed in the lymphoid tissue just under the peritoneum numerous caseous foci; the mucous membrane showed a few small congested ulcers. There were similar foci in the lymphoid tissue of the appendix. The rest of the intestine was normal.

Mesenteric Glands.—Three small glands in the posterior part of the mesentery showed irregular patches and foci of caseation in the cortices.

Lungs.—The right middle lobe contained a large caseous nodule, 1 cm. in diameter, with greyish red margin; in the middle of the right caudal lobe there was a somewhat larger similar mass; besides these the right lung contained about half-a-dozen opaque miliary tubercles. In the left lobes there were six or seven opaque miliary tubercles and one pea-sized nodule with a greyish-red margin.

The Right Bronchial Gland was enlarged, indurated and showed irregular caseous patches. The left bronchial was unaffected.

Other organs and glands were normal.

Microscopical.

Numerous T. B. were found in one of the caseous foci from the ileum and a few in one from the appendix.

RABBIT 346.

Fed on July 10th, 1905, with 1 mg. of culture of Virus B. IX

Initial Weight.—1,800 grammes.

Final Weight.—1,970 grammes.

Gain in Weight.—170 grammes.

Killed.—November 8th, 1905, 121 days later.

POST-MORTEM EXAMINATION.

Organs and glands healthy.

FEEDING EXPERIMENTS WITH VARIOUS VIRUSES.

The animals included in each of the three preceding series of feeding experiments were given tuberculous material originating from the same bovine virus. Besides these there is a considerable number of animals fed at different times and with tuberculous material, milk or culture, from different viruses, which do not form a uniform series.

These have been collected together and are considered in this report.

Some of the animals were fed with the object of studying the effects in a particular species of the ingestion of the bovine tubercle bacillus, others with the object of producing a less severe form of tuberculosis than would have resulted from any of the other methods of inoculation, with a view to prolonging to the utmost the duration of residence of a culture in a particular animal body.

Many of the latter animals are the second or even the third of a series of animals through which a virus has been passed. The full details of these experiments will be found in another part of the appendix (see modification experiments); they are briefly referred to here for consideration of the anatomical distribution of tuberculosis in feeding; only those experiments are included in which the cultures employed retained their original virulence unchanged.

ORANGS.

A young orang, fed with tuberculous milk of Cow 44 (Virus B. I.) for 12 days, died of acute diarrhœa 16 days after the experiment began. There was no sign of tuberculosis in the body, and guinea-pigs inoculated with emulsions made from the mesenteric glands, liver and spleen remained healthy.

Another young orang, fed with 0·01 milligramme of culture from Virus B. I. (Cow 44) died in 6 days of ulcerative colitis. The organs and glands were free from tuberculosis and guinea-pigs inoculated with emulsions made from the pharyngeal, precardiac and mesenteric glands remained healthy.

CHIMPANZEES.

Seven chimpanzees have been fed with bovine tuberculous material, two with tuberculous milk and five with culture; in two of the latter cases the culture used was derived from original material (Viruses B. IV. and B. IX.); in the other three the cultures were obtained from chimpanzees (*see* Modification Experiments, Vol. III.).

CHIMPANZEES FED WITH TUBERCULOUS MILK.

Chimpanzee 8 was fed on October 28, 1904 with 107 c.c. of the milk of Cow 172 (Virus B. IV.), estimated to contain 10,000,000 tubercle bacilli.

She remained well until March 14, 1905, when she contracted broncho-pneumonia; she died 7 days later, apparently from heart failure; the experiment had lasted 144 days.

On post-morten examination there were several tuberculous ulcers in the small intestine, nine mesenteric glands contained gritty fibro-caseous nodules, and three colic glands were caseous; there was no sign of tuberculosis elsewhere; a guinea-pig, however, inoculated with an emulsion from the spleen died of tuberculosis.

Chimpanzee 6 was fed for a week with milk of Cow 172, during which time about 1,000 c.c. were drunk.

The animal after a time became ill and gradually lost weight; it was killed, when dying, 100 days after the experiment began.

There were very numerous tuberculous ulcers in the small, and several in the large intestine. All the glands attached to the intestines were enlarged and caseous; there were a few caseous tubercles in the spleen and a moderate number of grey nodules, showing very little caseation, in the lungs.

CHIMPANZEES FED WITH CULTURE.

Chimpanzee 2 was fed on October 31, 1904, with 1 mg. of culture, derived from the original material of Virus B. IV.

The animal remained well until December 15, 1904, and then became quieter and began to lose flesh; he died on December 26, 1904, 56 days after the experiment began.

The post-mortem examination showed numerous ulcers in the small intestine; enlargement and caseation of the mesenteric and colic glands; caseous foci in the bronchial glands and a few tubercles in the spleen and lungs.

Chimpanzee 14 was fed on September 11, 1905, with about 1·1 mg. of culture derived from the original material of Virus B. IX. Illness very quickly supervened and he died of acute tuberculosis 63 days after the experiment began.

The abdominal organs were matted together, and there was very extensive ulceration of the mucous membrane of the intestines; the cervical glands and all the glands attached to the intestine were enlarged and caseating; the spleen was enlarged and contained sparsely scattered caseous tubercles; the kidneys and lungs contained discrete tubercles and there were doubtful points (? early tubercles) in the substance of the liver.

The tuberculosis in this case, as in Chimpanzee 2, was most severe in the intestines and attached glands.

Chimpanzee 10 was fed on July 16, 1905, with 0·1 mg. of culture obtained from a colic gland of Chimpanzee 8 and died on November 6, 1905, 113 days after.

The post-mortem examination showed general progressive tuberculosis with extensive tuberculous ulceration of the intestinal mucous membrane and great enlargement and caseation of the mesenteric glands.

Chimpanzee 16 was fed with 0·01 mg. of culture obtained from Chimpanzee 10; it died in 91 days of general tuberculosis, the mesenteric and retroperitoneal glands being much enlarged and extensively caseated.

Chimpanzee 18 fed on February 12, 1906, with 0·01 mg. of culture obtained from Chimpanzee 14, died in 116 days of very severe generalised tuberculosis. The left tonsil and the intestines were ulcerated; all the glands on the left side of the neck were enlarged and caseous, and formed a very large prominent mass; on the right side only the superior cervical glands were caseous; the mesenteric and several of the colic glands were much enlarged and advanced in caseation; there was a very intense tuberculous peritonitis, the parietal and visceral peritoneum being covered with tubercles, which in several places had fused together to form irregular caseating masses; the liver and spleen, and in several places the large intestine, were closely adherent to the wall of the abdomen; the lungs and liver contained scattered caseous nodules; the spleen was enlarged and showed numerous soft nodules in the pulp; the kidneys contained a few tubercles.

These experiments with chimpanzees show that the bovine tubercle bacillus can, when introduced into the alimentary tract, even in small dose, very readily set up tuberculosis in the anthropoid ape.

In five of the animals the disease produced was generalised, and progressive, and led to a fatal result in periods varying from 56 to 113 days.

In Chimpanzee 8 the tuberculous process in 144 days had not extended beyond, and appeared to be arrested in, the mesenteric and colic glands.

With this exception, chimpanzees have shown themselves to be as susceptible to tuberculosis as baboons and rhesus monkeys.

RHESUS MONKEYS.

Fourteen rhesus monkeys are considered; five were fed with tuberculous milk and nine with culture.

MONKEYS FED WITH MILK.

Monkey 62, a very young animal (*see* page 651), was fed with milk from the inoculated quarters of Cow 74 for 66 days, drinking during this time altogether about 9,785 cubic centimetres.

The milk was normal in general appearance and did not contain many tubercle bacilli, a few only being found after centrifugalisation.

The monkey remained well for several weeks and then began to exhibit signs of pulmonary distress; it was killed when ill, 71 days after the experiment began.

At the post-mortem examination two of the lobes of the right lung were found consolidated and caseating, and there were some large caseous areas in the rest of the lung; the bronchial and mediastinal glands were enlarged and caseous; the spleen contained numerous caseous nodules, 6 to 8 mm. in diameter; the liver and both kidneys contained a number of small tubercles, and there were a few small tubercles on the parietal pleura; the mucous membrane of the alimentary tract and the glands in connection with it (except one rectal gland, which contained a caseous focus) showed no sign of tuberculosis.

Monkey 70, also a young animal, was fed for 3 days with milk of Cow 74, at a later date than Monkey 62, receiving altogether about 40 cubic centimetres. The cow during this time was very ill, and gave only a very small quantity of milk, which was, however, extremely rich in tubercle bacilli.

The monkey was killed, when ill, 24 days after the experiment began and showed acute tuberculosis of the lungs (closely set miliary tubercles beginning to caseate), enlargement and early caseation of the bronchial and mediastinal glands and of the mesenteric and colic glands; two submaxillary glands contained minute foci; the spleen, liver and kidneys were normal to the naked eye, and there was no evidence of tuberculosis in the mucous membrane of the alimentary tract.

Monkey 72, an adult female, was fed with a very small quantity of milk withdrawn from the udder of Cow 74 after her death; the monkey died as the result of an accident 19 days after the experiment began and no tuberculous lesions were found; guinea-pigs, however, inoculated from the submaxillary and mesenteric glands became tuberculous.

Two adult rhesus monkeys, Nos. 64 and 66, were fed with milk of Cow 68 for 33 days; both were killed 87 days after the experiment began and showed generalised tuberculosis.

In one, No. 66, infection appeared to have spread from the cœcum, in which there were some tuberculous ulcers; the adjacent colic glands were enlarged and caseous, and there were sparsely scattered caseous nodules in the lungs, liver and spleen.

In the other there were some ulcers in the cœcum, apparently of old standing (probably dysenteric), and no disease of the glands in connection with the alimentary tract; the liver, spleen and lungs contained numerous caseous nodules; the right lung contained besides a caseous mass 2·5 cm. in diameter; the dorsal and ventral mediastinal glands were very large and extensively caseous; the right bronchial gland contained some small tubercles and each kidney contained one tubercle; there were numerous caseous nodules in the omentum and on the mesentery and meso-colon. It was not certain in this case that the tuberculosis was set up by the bacilli administered; the caseous mass in the lungs seemed to be too old to have been produced during the period covered by the experiment, and moreover, other lesions were much more advanced than those in the companion monkey; this case must therefore be excluded from further consideration.

MONKEYS FED WITH CULTURE.

Monkey 74 was fed six times with culture derived from Cow 68 (Virus B. III.) and died 40 days after the experiment began. The small intestine showed extensive early tuberculosis, the ileo-colic glands were enlarged and caseous, and there were caseous foci in the mesenteric, colic, submaxillary, pharyngeal, cervical and thoracic glands; the lungs contained about a dozen caseous nodules; the liver and one kidney each contained a small tubercle and there were three caseous tubercles in the spleen.

Monkey 104 was fed with 1·0 mg. of culture derived from the original material of Virus B. IV.; it died 13 days later and showed no sign of tuberculosis.

A series of four rhesus monkeys was fed with culture obtained from the supramammary lymphatic gland of Cow 44 (Virus B.I.); they were fed at the same time as Orang 8, with the object of comparing the relative susceptibility of these two species of animals.

Two of the monkeys received the same dose as the orang, i.e., 0·01 mg.; the other two were given much smaller doses, 0·0001 and 0·00001 mg. respectively.

The primary object of the experiments was unfulfilled owing to the orang dying soon after it was fed.

The series is, however, of interest as showing the variations in the distribution of tuberculosis after feeding.

Monkey 78, dose 0·01 mg., was killed in 71 days and showed tuberculous ulcers in the small intestine, great enlargement, caseation and softening of the mesenteric glands, and caseous nodules in all the organs and many of the glands; there were also numerous caseous nodules in the omentum.

Monkey 76, dose 0·01 mg. was killed when dying, 228 days after the experiment began; the post-mortem examination showed some small ulcers in the small intestine, caseation and softening of the pharyngeal and mesenteric glands, and widespread generalised tuberculosis; the lungs were very severely affected, and the bronchial glands were larger and more extensively caseous than the mesenteric or pharyngeal.

In Monkeys 80 and 82, killed in 165 and 176 days respectively, the distribution of the disease was practically identical; in neither was there any sign of tuberculosis in the alimentary tract or abdominal lymphatic glands (in Monkey 82 a pharyngeal gland was caseous), but in both extensive tuberculosis of the lungs and thoracic glands.

Two monkeys were fed with culture obtained from Monkey 116 (Virus B. IX.) (*see* Modification Experiments, Vol. III.), one receiving 0·01 mg., the other 0·0001 mg.

The first, No. 130, died in 86 days, and showed consolidation and caseation of the right middle lobes and discrete caseous nodules in the rest of the lung, caseation of the bronchial glands, numerous yellow nodules in the spleen, and a few tubercles in the liver and kidneys; there was no disease of the alimentary tract, and all the glands in connection with it were normal, except one ileo-colic gland, which contained a small tubercle. The second animal, No. 132, died in 134 days; in this case also there was no tuberculosis of the mucous membrane of the alimentary tract or of the glands attached to it (except one mesenteric and one gastric gland), but extensive tuberculosis of the lungs and thoracic glands; one lobe of the lung was solid throughout and advanced in caseation, the others contained caseous masses or discrete tubercles: the bronchial glands were enlarged and caseous, and the spleen and liver contained caseous nodules.

Two monkeys were fed with culture obtained from Baboon 68 (Virus B. IX.) (*see* Modification Experiments, Vol. III.), one receiving 0·01 mg., the other 0·0001 mg.

The one fed with 0·01 mg. No. 126, died in 120 days, and showed two tuberculous ulcers in the small intestine, great enlargement, caseation and softening of the mesenteric glands, numerous yellow caseous nodules in the lungs and spleen, and a few in the liver and kidneys; the bronchial and lumbar glands were enlarged and caseous: there was a caseous nodule in one suprarenal, and one on the internal surface of the dura mater. The other monkey was killed after 169 days and found to be perfectly healthy.

Consideration of Results.—In five of the experiments detailed above the disease appeared to have originated in the thorax, the type of disease presented being that of an inhalation tuberculosis.

In the others, excluding Monkey 64, the distribution of the disease was such that there could be little doubt that the tuberculosis was caused by the bacilli ingested; there were lesions at the sites of entry in the small intestines (except in Monkey 70), and tuberculosis of the mesenteric glands, and nothing in the organs to suggest the existence of tuberculosis prior to the experiment. Moreover, from several of the animals cultures have been isolated which showed characters on the differential media peculiar to those of the particular virus used.

In the first five cases it was not at first so clear that the bacilli introduced had set up the disease.

Rhesus monkeys are very liable to contract tuberculosis naturally, and since in the naturally infected animal the disease usually makes its appearance in the thorax, the possibility of this mode of infection in these cases must be taken into consideration.

The tuberculin test in the early part of the work was not found to give satisfactory results, no reaction at all being obtained, even when the monkey was known to be tuberculous, and was for some time practically abandoned, reliance being placed on general appearances for the elimination of unsound animals; better success has since been obtained by using larger doses of tuberculin, and making earlier and more frequent observations on the temperature.

Monkeys 80 and 82 were not tested before experiment. Monkey 80 was a strong, active, well-nourished male, healthy apparently in every respect. Monkey 82 was not in such good condition; there were no obvious signs of ill-health, but she was not so active as the other, and her coat was a little rough; these appearances have, however, been observed in other adult female rhesus monkeys, and have been found to be not inconsistent with perfect health.

Monkeys 62, 130, and 132 were tested with tuberculin and did not react; they were all healthy looking animals and had good appetites.

Monkey 62 was a young animal and was born at sea; he was suckled by his mother until her death, and was then brought up on sterilized food; a post-mortem examination was made on the mother and she was found to be free from tuberculosis. Two other rhesus monkeys, Nos. 68 and 70, were born at sea at about the same time as Monkey 62, and were kept under identical conditions. Monkey 68 was used as a control and was perfectly healthy when killed.

From the tuberculous lesions of four of the five animals under consideration cultures were isolated direct; these exhibited characters on the differential media identical with those of the respective viruses used; two of the cultures have been tested on rabbits with the production in all cases of fatal general tuberculosis. A culture was also isolated from Monkey 62, but was lost before being tested on the differential media, two calves, however, inoculated with an emulsion made from the tuberculous organs died of general tuberculosis, and cultures obtained from these had the cultural characters of the virus used.

In these five cases, therefore, there was no reason to think that the tuberculosis was not experimentally induced.

There remains to be considered the mode of infection.

Four of the monkeys were fed by means of a pipette, the culture suspension being allowed to trickle slowly on to their tongues; the fluid appeared to be swallowed in a natural manner and there was no choking, yet there can be little doubt that in all these cases some of the material gained direct access to the lung alveoli by way of the bronchial tubes.

Monkey 62 drank the milk out of a trough, and in this case also, as will be seen from the history of the monkey's habits and its manner of drinking, there is the possibility that the bacilli were insufflated or inhaled.

It is very highly improbable that in rhesus monkeys tubercle bacilli can pass through the mucous membrane of the alimentary tract and attached glands in such numbers as to produce the acute tuberculous pneumonia found in this animal and leave no trace of their passage.

Bacilli can undoubtedly pass through the alimentary mucous membrane and infect the lungs directly, as was shown in the series of monkeys included in the third special feeding experiment, but in these cases the lesions in the lungs were few and discrete, and the intestines and mesenteric glands were tuberculous in every instance.

BABOONS.

Fourteen baboons have been fed, four with tuberculous milk and ten with culture.

BABOONS FED WITH TUBERCULOUS MILK.

This series comprises two adult and two young baboons; the adult baboons and one of the young ones were of the South African variety (*Papio porcarius*); the other young one came from East Africa.

The baboons had lived for some time in the same house as some other baboons which had been found to be suffering from tuberculosis naturally acquired; instead of destroying them on that account it was decided to use them for experiment, provided they successfully passed the tuberculin test.

Three of the baboons were tested twice, the second test taking place six weeks after the first; the fourth baboon, an adult, was tested once only.

In one of the young baboons, No. 30, the first inoculation of tuberculin was followed by a rise of temperature of 0·8°C.; there was no constitutional disturbance and the second test with twice the dose of tuberculin was negative. Viewed in the light of the result of the post-mortem examination on this animal there can be no doubt that the rise of temperature though slight was due to the presence of tuberculous lesions. The baboon died 30 days after the experiment began and showed chronic lesions of tuberculosis in the thoracic cavity.

In the other three baboons the tests were completely negative and when examined on the termination of the experiments there was nothing in the appearance or the distribution of the lesions to suggest that the tuberculosis was not induced experimentally.

Each of the baboons was fed for 25 days with milk of Cow 172, receiving during this time about 2,000 c.c.

One of the adult animals was killed when ill, 85 days after the experiment began; the other died in 90 days; both showed tuberculosis of the tonsils, stomach and intestines, enlargement and caseation of the glands in connection with the alimentary tract and generalised tuberculosis of a very severe type. The young baboon died 80 days after the experiment began; there was extensive tuberculosis of the intestines, pharyngeal, mesenteric and colic glands, and tuberculosis of all the organs; the latter were distinctly less severely affected than in the adult animals.

The chief object of this feeding experiment was to compare the relative susceptibilities of the young and adult. In the first series of feeding experiments age in this species did not appear to have any influence in modifying the extent or the severity of the disease, the adult animals being, if anything, more severely affected than the young.

In this series also the disease in the adult baboons was of slightly greater severity than in the young one.

BABOONS FED WITH CULTURE.

Two East African baboons, a young one and an adult, were fed with culture from Virus B.I., each animal receiving 5 mg.

The young baboon died in 28 days, and showed slight tuberculosis of the intestines, early caseation of the mesenteric and neck glands, and a few tubercles in the spleen, lungs, and bronchial glands and on the omentum. The adult was killed in 29 days; there was slight tuberculosis of a pharyngeal gland, the liver, kidneys and omentum, and extensive tuberculosis of the lungs and bronchial glands; there was no disease of the alimentary mucous membrane. The tuberculosis in this animal was undoubtedly acquired naturally; a bacillus was isolated from the lungs which had the characters of a Group II. organism.

Two other baboons, one young and one adult, were fed with culture from Virus B.IV., each animal receiving 1 mg.

The young one died in 74 days, and showed ulceration of the tonsils and intestines, caseation of the adjoining glands and miliary tuberculosis of all the organs.

The adult animal was killed in 77 days, to compare the extent and severity of the disease in the two cases; the post-mortem examination showed the right middle lobe of the lung consolidated and in a state of caseous pneumonia, and caseation of the nearest bronchial glands; there was no tuberculosis elsewhere.

The tuberculin test before experiment was negative and a culture isolated from the lungs was identical with the culture inoculated.

The animal was fed by means of a pipette and it is possible that in this case, as in those of the rhesus monkeys mentioned above, some or all of the culture suspension (1 cubic centimetre) was drawn into the lung alveoli at the time of feeding.

Five baboons have been fed with culture obtained from baboons or monkeys which had been fed with bovine tuberculous material (*see* Modification Experiments). The dose in each case was 0·1 mg.

One adult baboon died of cysticercosis in 46 days and showed tuberculosis of one pharyngeal gland only.

Another baboon, a young animal, died in 25 days, and only one minute yellow focus, containing tubercle bacilli, was found in one of the Peyer's patches in the small intestine. The other three baboons, Nos. 64, 66, and 62, all adults, died in 101, 133 and 136 days respectively, of very severe generalised tuberculosis.

The experiments show that tuberculosis is very readily set up in baboons by feeding; in every animal, excluding those which died prematurely, the tuberculosis was generalised and progressive and ended fatally.

The experiments show further that individuals of this species do not become more resistant to tuberculosis as they grow older.

CALVES.

Six calves were suckled for periods varying from 33 to 190 days by cows which had been artificially infected in the udder with tuberculosis. The calves in four cases began to feed the day after, and in two, 7 and 18 days after the cows were inoculated.

Calf 38 was suckled by its mother Cow 40, from the day following her inoculation until her death, a period of 74 days, and was killed 74 days after the experiment began; the calf was five months old at the beginning of the experiment.

Milk from the inoculated quarters of Cow 40, during the whole of this period was being withdrawn to feed Pigs 6 and 8 before the calf was allowed to suck; the milk in the uninoculated quarters was left for the calf; in the intervals between its meals the calf was tied up apart from its mother. The milk from the uninoculated quarters, tested on guinea-pigs on five different occasions, the last being on December 2, never produced tuberculosis in these animals. The calf must therefore have obtained an extremely small quantity of tuberculous milk. The post-mortem examination showed slight tuberculosis limited to the intestines and mesenteric glands.

Calf 86 was suckled by its foster-mother, Cow 74, for 190 days and was killed 190 days after the experiment began. The milk of the cow during this time was quite normal in general appearance and tubercle bacilli were not very numerous in it.

On post-mortem examination one tuberculous ulcer and two submucous nodules were found in the small intestine; one mesenteric gland was partly caseo-calcareous and two contained each a small caseo-calcareous tubercle; two ileo-colic glands, one gastric and one cœcal gland were caseo-calcareous throughout; the liver contained two small caseo-calcareous nodules; other organs and glands were normal.

Calf 20 was suckled by its foster-mother, Cow 18, for 34 days, that is from the day following her inoculation to the day of her death.

During the first 20 days the calf received all the milk from the four quarters, but during the remaining period most of the milk was used to feed Pigs 2 and 4, and for 9 days Calf 50 also.

The amount of tuberculous milk obtained by Calf 20 during the last 14 of the 34 days it was sucking was probably very small.

The post-mortem examination showed four or five of the Peyer's patches, two or three feet above the ileo-cœcal valve, thickened with little yellowish white nodular deposits beneath the mucous membrane. The latter was quite intact over them, but a slight puckering suggested the previous existence of some ulceration. On the serous surface of these patches were groups of rather prominent yellow tubercles as large as mustard-seeds. In the upper part of the duodenum also were a few hard yellowish spots beneath the mucous membrane. All the mesenteric glands contained yellow calcareous and softened patches and some were almost entirely calcareous and caseous. In the liver one spherical hard tubercle as large as a mustard seed was seen. On the surface of the right cephalic lobe of the lung were little pedunculated or sessile masses, and on the contiguous part of the costal pleura was a flattened raised growth of yellowish tissue. There were no lesions anywhere else. Guinea-pigs inoculated from the bronchial gland and spleen did not develop tuberculosis.

Calf 116 was suckled by its mother, Cow 68, for 47 days; for the first eleven days the calf took all the milk from the inoculated quarters, but for the remaining 36 days it got only that which was secreted during the day, all the morning milk from the infected quarters being used to feed Monkeys 64 and 66. The calf was killed 92 days after the experiment began and calcareo-caseous nodules were found in the intestines and mesenteric glands and one tubercle in the lung and one in the spleen.

Calf 22 was suckled by its mother, Cow 4, for 34 days; it was three months old when the experiment began; during the last six of the 34 days the milk of Cow 4 was used to feed pigs as well. The calf became thin and for some weeks suffered from fever; its health then began to improve; it gained in weight and eventually grew into a very fine bull. It was killed 363 days after the experiment began.

On post-mortem examination caseo-calcareous nodules were found in all the Peyer's patches, some of those in the ileum being ulcerated; there was a caseating nodule on the palate, caseous nodules in the submaxillary and pharyngeal glands, encapsuled caseo-calcareous nodules, $\frac{1}{10}$–$\frac{3}{4}$ in. in diameter, in the mesenteric glands and two nodules on the surface of the liver; the portal and thoracic glands were slightly affected; all other organs and glands were normal, except the right prescapular, which contained a few tubercles.

Calf 50 was suckled by its mother, Cow 500, for 31 days, and by its foster-mother, Cow 18, for 10 days; the milk of Cow 500 during the last 11 of the 31 days and that of Cow 18 during the whole of the 10 days was being used to feed other animals. The calf got progressively thinner and suffered from continued fever; it was killed when thin and emaciated 151 days after the experiment began.

The post-mortem examination showed extensive tuberculosis of the digestive tract. The small intestine was riddled with ulcers, which in places were more or less confluent for several inches together. On the peritoneal surfaces of some of the intestinal ulcers were little pedunculated or sessile tubercles; the tonsils and nasal septum were tuberculous. The lymphatic glands connected with the alimentary canal were greatly enlarged and caseo-calcareous throughout. There were numerous pea-sized nodules in the liver, about two dozen in the lungs and a few (8 to 12) in the spleen.

The disease in this animal was most severe in the alimentary tract and associated glands, and the emaciated condition of the calf was no doubt due to the extensive implication of these regions.

Consideration of Results.—This series of experiments shows that progressive tuberculosis is not readily set up in calves when the tuberculous material is introduced by way of the alimentary tract. In one animal only was the disease at all severe, and even in this one the disseminated lesions were encapsuled and calcifying, and were not numerous enough to have seriously impaired the function of the organs in which they were found.

In Calves 20 and 22 the disease was moderately severe in the intestines and mesenteric glands, but there was very little disseminated disease.

In the other three calves the disease was practically limited to the intestines and mesenteric glands.

The great variations in the degree of infection in this series can be attributed partly to differences in the dose and partly to differences in age.

Calf 50 was the youngest animal of the six and was the most severely affected; Calf 38 was the oldest and showed the least amount of tuberculosis.

Calves 50, 20 and 22, which received milk from acutely infected udders, and probably a large number of bacilli, were more severely affected than those calves (Nos. 38 and 86) fed for longer periods with milk from cows with more chronic disease of the udder; the milk in both the latter cases was normal in appearance and was not very rich in tubercle bacilli.

Calf 116, although fed with milk from an acutely infected udder, developed only a limited tuberculosis; probably the reason for this was that the dose of tubercle bacilli injested daily was not very large, for during the last 36 of the 47 days it was sucking, most of the milk from the inoculated quarters was being withdrawn to feed Monkeys 64 and 66.

This calf and Calves 38 and 86 must nevertheless have each ingested considerably more than 5,000,000 tubercle bacilli, yet they are found to have fewer lesions than several calves (in the first feeding experiment) fed with single doses of milk containing 5,000,000 to 10,000,000 tubercle bacilli.

A comparison of the two sets of experiments seems to indicate that a single dose of tubercle bacilli may give rise to a more extensive tuberculosis than the same or a larger dose spread over several weeks.

PIGS.

FED WITH TUBERCULOUS MILK.

Four pigs have been fed with milk from cows artificially infected in the udder with tuberculosis.

Two were fed with milk from Cows 500, 4 and 18 during a period of 21 days, and two with milk of Cow 40 for 92 days.

The first two animals, Nos. 2 and 4, were six weeks old when the experiment began, and were killed 160 and 264 days later respectively.

Both showed generalised tuberculosis, the pharyngeal and the abdominal lymphatic glands in each being severely affected; in one, lesions were found in the tonsils and small intestines; in the other the tonsils were normal, whilst some of the Peyer's patches in the small intestine contained pin-head sized yellow foci.

Both pigs were exceptionally well nourished and were fatter than pigs of the same litter which had not received any milk, and this in spite of the fact that all the lymphatic glands draining the alimentary canal were entirely destroyed by caseation.

The second two animals were older than the first two and were fed for a longer period. They were killed 99 and 247 days respectively after the experiment began and showed generalised tuberculosis, but of a much less severe type than in the first two. The tonsils were normal in both cases, and the intestines in one contained two caseous nodules and one small tubercle only.

The difference in the severity of the disease in these two sets of animals was most probably due to the difference in their ages; other feeding experiments have conclusively shown that as the pig grows older it becomes much more resistant to tuberculosis.

Pig 92 was fed with 107 cubic centimetres of milk from Cow 172, containing 10,000,000 tubercle bacilli. It was killed when very ill in 137 days and showed very extensive general tuberculosis. All the organs were affected the lungs very severely. The tonsils were ulcerated and there was a chain of enlarged tuberculous glands on each side of the neck extending along the carotid vessels. No lesions were found in the intestines, and only a few small caseous nodules in the mesenteric glands.

Infection in this case took place chiefly through the tonsils.

This pig was fed at the same time as Chimpanzee 8, and with the same dose of milk. Whereas in the pig the tuberculosis was general and progressive, in the chimpanzee it was limited to the intestines and neighbouring glands, and appeared to be arrested.

Two young pigs were fed with milk of Cow 300 for 8 days, receiving during this period no other food; Cow 300 was inoculated subcutaneously with 100 mg. of culture from the original material of Virus B. VI. through the guinea-pig.

One of the pigs was fed during the second week after her inoculation; the other during the third. Guinea-pigs inoculated with the milk, the dose in each case being 5·0 c.c., at the beginning and at the end of each experiment, developed tuberculosis of a mild type.

The pigs were killed in 82 and 95 days and neither showed any sign of tuberculosis.

These two experiments demonstrate that young pigs, so susceptible as they are to tuberculosis, may ingest small numbers of tubercle bacilli and escape infection.

FED WITH CULTURE.

Two pigs, aged 9 weeks, were fed with culture derived from the original material of Virus B. XXVIII., one receiving 10 mg., the other 1 mg.

They were killed in apparent good health 104 and 109 days afterwards respectively, and both were found to have general tuberculosis, the disease being most severe in the animal which received the larger dose. The tonsils in each case were scarred, and the sumaxillary, pharyngeal, and cervical glands were extensively caseous; the mesenteric, cœliac, portal, and bronchial glands were affected to a lesser extent. The lungs, liver, and spleen contained discrete caseous nodules with fibrous capsules, the lungs in each case containing more than the liver and the liver more than the spleen; in one of the animals a kidney contained a caseous tubercle; in the other the kidneys were normal.

DOGS.

Eleven dogs have been fed with culture; in six instances the culture used was derived from the original material of a bovine virus; in the remaining ones the culture had previously passed through a dog, or a series of dogs.

The doses varied from 1 to 100 mg.

Three of the dogs, two fed with 1 mg., the other with 32·5 mg., showed no sign of tuberculosis in any organ or gland.

One fed with 25 mg. of a glycerin serum culture, and killed 64 days after showed tuberculosis of one pharyngeal gland and a few caseous nodules in the lungs.

Another fed with 10 milligrammes of culture from Dog 74, Virus B. IV., and killed 98 days after, showed some doubtful yellow foci in the intestines, enlargement and caseation of the pharyngeal glands, one cervical gland, the mesenteric and ileo-colic glands, sparsely scattered minute grey tubercles in the liver, moderately numerous nodules in the lungs, and a caseous focus in each of two enlarged bronchial glands. This was the most severe case of tuberculosis produced in the dog by feeding.

In the other five dogs there was no disease of the alimentary tract or glands in connection with it, but in each one or two small tubercles in the lungs; these tubercles were of the fibrous variety and were translucent throughout except one (*see* Dog 102), which showed a fibro-caseous centre.

These experiments demonstrate conclusively that the dog possesses a high degree of resistance to the bovine tubercle bacillus and is with difficulty infected when the material is introduced by way of the alimentary tract.

An interesting anatomical feature in these feeding experiments is the frequency with which small lesions were found in the lungs without apparent disease in the alimentary tract or in the glands in connection with it.

CATS.

Two cats were fed with culture derived from the original material of Virus B. XXVI., each receiving 10 mg.

One killed 71 days later showed two or three doubtful points in a mesenteric gland, a smear preparation from which showed no tubercle bacilli, and a few tubercles and nodules in the lungs; there was no sign of disease elsewhere.

In the other, killed 73 days after feeding, there were some caseous foci in the tonsils, caseous patches in the pharyngeal glands, left submaxillary gland, mesenteric glands and ileo-colic glands, a few caseous foci in the bronchial glands and one caseous focus in the portal gland, a caseous nodule in the spleen and numerous caseating miliary tubercles in the lungs; the intestines were normal.

GUINEA-PIGS.

Four guinea-pigs were fed with the tuberculous milk of Cow 44 for 6 days; they were killed by a dog, which broke into the guinea-pig house, 26 days after the feeding began.

All the guinea-pigs showed lesions in the small intestines and mesenteric glands; in one of the animals the submaxillary glands, and in two of the others the colic glands were also affected; in none of the animals had the disease extended beyond the nearest glands.

Four other guinea-pigs were fed with milk of Cow 44 for 11 days. Two of these died at the end of this time and showed no sign of tuberculosis.

The other two were killed 40 days after the experiment began; in one the tuberculosis had not extended beyond the glands of the alimentary tract; in the other there was a caseous nodule in the ileum, the mesenteric and ileo-colic glands were enlarged and caseating, and there were a few small tubercles in the spleen and liver.

Three guinea-pigs were fed with milk of Cow 172 during a period of 52 days. Two were killed 52 days after the experiment began; in one there were a few tubercles in the lungs, a few minute yellow points in the liver and no disease elsewhere; in the other both bronchial glands were caseating, there were a few yellow foci in the liver and no tuberculosis elsewhere; the third guinea-pig was killed 79 days after the experiment began and showed an ulcerated caseous nodule in the small intestine, caseation of one mesenteric gland and of the portal and bronchial glands, and tuberculosis of the lungs (slight), liver and spleen.

The disease in the first two animals had an unusual distribution and was most probably set up by bacilli which had been inhaled.

Two guinea-pigs were each fed by means of a pipette with a small quantity of milk of Cow 44, containing approximately 250,000 tubercle bacilli. One died in 18 days, and showed tuberculosis of the intestine, mesenteric glands, liver and spleen. The other was killed in 114 days and was found perfectly healthy.

Two guinea-pigs were fed with culture obtained from Guinea-pig 14; one received 5·0 mg., the other 0·5 mg.; both were killed 31 days after.

The guinea-pig fed with 5 mg. showed tuberculosis of the intestines and the attached glands, of the glands in the neck and of the lung, spleen and the portal gland.

The guinea-pig fed with 0·5 mg. showed caseation of the submental glands and a cervical gland and a few doubtful foci in the liver.

RATS.

Altogether twenty-six rats have been fed. Four of these were fed for 20 days with milk of Cow 44; twelve for 11 days on tuberculous milk, and then during 33 days on tuberculous tissues, the organs of four rabbits and twelve guinea-pigs being used; four over a period of 23 days and five over a period of 12 days, with the tuberculous organs of guinea-pigs, fifteen guinea-pigs being used in each series.

None of the rats developed tuberculosis.

The intestines were in every case carefully examined, and in no case was there any sign of disease. There was never any enlargement of the mesenteric glands, and in two cases only were lesions observed: these took the form of minute grey points, barely visible to the naked eye, which microscopically were seen to be small areas of necrosis containing tubercle bacilli.

Cover glass preparations showed tubercle bacilli to be present in the mesenteric glands (or ileo-colic) in 17 cases; in nine instances the result of the examination was negative (in one of these tubercle bacilli were found in the cœliac gland), and in two no microscopical examination was made; on several occasions smears were examined from the large organs, always with a negative result.

In the great majority of the rats, the whole, or some part, of a lung was collapsed and consolidated and several of the rats died as a result of this condition. The cause of the disease has not been ascertained; it appears to begin in the bronchi, which become blocked with secretion, and is followed by collapse of the lung; in cases of old standing the solid lobes contained large yellow nodules which were thin walled cysts filled with greenish yellow pus.

Of all the animals experimented upon the rat proves to be the least susceptible to tuberculosis; only the organs and glands of acutely infected guinea-pigs were used in the above experiments, so that the numbers of tubercle bacilli ingested by many of the animals must have been enormous.

HEDGEHOGS.

An opportunity was afforded, by the capture of several hedgehogs in the fields around the farm, of testing the susceptibility of this species of animal to tuberculosis.

Two hedgehogs were fed with single doses of tuberculous milk, each receiving 1,000,000 tubercle bacilli; both died, one 26 days, the other 72 days, after feeding, and neither showed naked eye lesions of tuberculosis.

Two were fed with tuberculous milk of Cow 172 for 43 days; one was killed 43 days after the experiment began and was found to be healthy; the other died 128 days after the beginning of the experiment, apparently from nephritis, and showed on post-mortem examination tuberculosis of the cervical glands and the left pharyngeal gland, the rest of the body being free from tuberculosis.

Two other hedgehogs were fed at one meal with milk to which an emulsion made from the tuberculous organs of a guinea-pig had been added.

One died 55 days after the feeding; on post-mortem there was tuberculosis of the left cervical gland and the pharyngeal glands; in the omentum there were some hard yellowish white gritty bodies in which tubercle bacilli were numerous; other organs and glands were normal to the naked eye, but tubercle bacilli were found in smear preparations from a mesenteric gland and the spleen.

The other hedgehog died 60 days after feeding; one gland near the angle of the jaw was tuberculous, but there was no naked eye evidence of tuberculosis elsewhere; tubercle bacilli were found in a macroscopically unchanged mesenteric gland.

Two hedgehogs were fed with culture derived from the original material of Virus B. IX., each animal receiving 1 mg. They were killed 47 and 111 days afterwards respectively, and both were found to be free from tuberculosis.

Two hedgehogs received each 10 mg. of culture from the original material of Virus B. XXI. Both died, one in 55 days, the other in 52; in the former there was no sign of tuberculosis; in the latter one pharyngeal gland contained a caseous focus.

Hedgehogs therefore do not appear to be very susceptible to tuberculosis when the tuberculous material is administered by feeding.

Animal.	Age.	Description of Experiment.	Duration of Life.	Sites of Entry.			Lymphatic Glands of the Alimentary Tract.						Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Serous Surfaces.		Coeliac Gland.	Other Lymphatic Glands.
				Tonsils.	Intestines.		Retro-pharyngeal Glands.	Cervical Glands.	Gastric Glands.	Mesenteric Glands.	Ileo-colic glands.	Colic Glands.										
					Small.	Large.													Peri-toneum.	Pleura.		
Chimpanzee 2 -	Young	Fed on November 1, 1904 with 1mg. of culture of Virus B. IV.	56 days (died).		+	+				✦	+	+	+	+	+							
Chimpanzee 6 -	Young	Fed for a week with milk of Cow 172. (Virus B.IV.)	100 days (killed ill).		✦	+				✦	✦	✦	+	+ (Slight)	+			?	+			
Chimpanzee 8 -	Young	Fed on October 28, 1904, with 107 cc. milk of Cow 172 (Virus B.IV.) containing 10 million T.B.	144 days (died.)		+					+		+	Broncho-pneumonia ; No tuberculosis.		No lesions G.P. became tuberculous.							
Chimpanzee 14 -	Young	Fed on September 11, 1904, with 1·1 mg. of culture from the original material of (Virus B.IX.)	63 days (died).	?	✦	+		✦		✦	✦	+	+	+	+	+	+	+	✦	+		+
Chimpanzee 10 -	Young	Fed with 0·1 mg. of culture obtained from Chimpanzee 8.	113 days (died).		✦	+		✦		✦	✦	+	✦		✦	+	+	+	+			+
Chimpanzee 16 -	Young	Fed with 0·01 mg. of culture obtained from Chimpanzee 10.	91 days (died.)		✦		✦	+	+	✦	✦	+	+	+	✦	+	✦	+	✦	+	+	✦
Chimpanzee 18 -	Young	Fed with 0·01 mg. of culture obtained from Chimpanzee 14.	116 days (died)	✦	✦		✦	✦	+	✦	✦	✦	+	+	✦	+	+	+	✦	+		+

Animal.	Age.	Description of Experiment.	Duration of Life.	Tonsils.	Intestines.		Submaxillary Glands.	Retro-pharyngeal Glands.	Cervical Glands.	Gastric Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Serous surfaces.		Coeliac Glands.	Other Lymphatic Glands.
					Small.	Large.														Peritoneum.	Pleura.		
Rhesus Monkey 62 -	11 weeks	Fed for 65 days with milk of Cow 74 (Virus B.I.).	71 days (killed).									+	+	✦	✦	✦	+		+				
Rhesus Monkey 70 -	7 months	Fed for 3 days with milk of Cow 74.	24 days (killed).				+				+	+	+	✦	✦								
Rhesus Monkey 72 -	Aged	Fed once with small quantity of milk of Cow 74.	19 days (died).				No lesions; G. P. became tuberculous.				No lesions; G. P. became tuberculous.												
Rhesus Monkey 64 -	Aged	Fed for 33 days with milk of Cow 68 (Virus B.III.).	87 days (killed).			+ ? dysenteric.				?				+	✦	✦	✦	+	+	✦	+		+ lumbar.
Rhesus Monkey 66 -	Aged		87 days (killed).			+							+	+	+	+	+	+					
Rhesus Monkey 74 -	Young Adult	Fed six times with culture from Cow 68 between Nov. 21st and Dec. 9th, 1903.	40 days (died).		✦	+	✦	✦	+		✦	+	+	+	✦	+	+		+				
Rhesus Monkey 76 -	Adult	Fed with culture obtained from Cow 44. Dose. 0·01 mg.	228 days (killed).		+			✦	+		✦	✦	✦	✦	✦	✦	✦	✦	+	✦ Omentum.	+ and pericardium.	✦	Most of the outlying glands.
Rhesus Monkey 78 -	Adult	0·01 „	71 days (killed).		+						✦			✦	+	✦	+		+	✦ Omentum.	+	+	Many lymphatic glands.
Rhesus Monkey 80 -	Adult	0·0001 „	165 days (killed dying).											✦	✦	+	+		+				
Rhesus Monkey 82 -	Adult	0·00001 „	176 days (killed).											✦	✦	✦	✦	+	+	+	+ and pericardium.	+	
Rhesus Monkey 130 -	Young Adult	Fed with 0·01 mg. of culture from Monkey 116 (Virus B.IX).	86 days (killed dying).									+		✦	+	✦	+		+		+	+	
Rhesus Monkey 132 -	Young Adult	Fed with 0·0001 mg. of culture from Monkey 116 (Virus B.IX).	134 days (died).							+	+			✦	+	+	+	+		? +			+ one axillary.
Rhesus Monkey 126 -	Young Adult	Fed with 0·01 mg. of culture from Baboon 68 (Virus B.IX.).	120 days (died).		+					+	✦			✦	✦	+	+		+	+	+		+ lumbar.
Rhesus Monkey 128 -	Young Adult	Fed with 0·0001 mg. of culture from Baboon 68 (Virus B.IX.).	169 days (killed).	No tuberculosis.																			

Animal.	Age.	Description of Experiment.	Duration of Life.	Portals of Entry.			Glands in connection with the Alimentary Tract.																
					Intestines.															Serous surfaces.			
				Tonsils.	Small.	Large.	Submaxillary Glands.	Retro-pharyngeal Glands.	Cervical Glands.	Gastric Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands	Spleen.	Liver.	Portal Glands.	Kidneys.	Peritoneum.	Pleura.	Coeliac Glands.	Other Lymphatic Glands.
Baboon 28 -	Young	Fed with milk of Cow 172 for 25 days, each animal consuming about 2,000 cc.	80 days (died).	?	+	+		✦	+		✦	✦	✦	✦	+	+	+	+		+			1 lumbar.
*Baboon 30 -	Young		20 days (died).				+	+				+		+	+	+	?		+ 1 tubercle			+	
Baboon 22 -	Adult		90 days (died).	✦	✦ (and stomach).	+	+	✦	+	+	✦	✦	+	✦	+	✦	✦	✦	+	+	+		+
Baboon 20 -	Adult		85 days (killed, ill).	✦	✦ (and stomach).	+	+	✦	✦		✦	✦	+	✦	+	✦	✦	✦	✦	✦	+	✦	+
Baboon 40 -	Young	Fed with 1 mg of culture from Virus B. IV.	37 days (died).	+	+		✦	✦	+		+	+				No lesions; G.P. became tuberculous.							
Baboon 52 -	Young	Fed with 1 mg. of culture from Virus B. IV.	74 days (died).	✦	✦	+		✦	✦		✦	✦	+	✦	✦	✦	✦	?	+	+ Slight.		+	lumbar.
Baboon 50 -	Adult	Fed with 1 mg. of culture from Virus B. IV.	77 days (killed).											+	+								
Baboon 68 -	Adult	Fed with 0·01 mg. of culture from Mangaby 4 (Virus B. IX.).	46 days (died).					+															
Baboon 66 -	Adult	Fed with 0·1 mg. of culture from Monkey 76 (Virus B. I.).	133 days (died).	Ulcer in Pharynx.	+			✦	✦		+	+	+	+	+	+	+	+		+	+		
Baboon 64 -	Adult	Fed with 0·1 mg. of culture from Baboon 8 (Virus B. IX.).	101 days) (died).	✦	+		+	✦	✦	+	✦	✦	+	+	+	✦	+	+	+	✦	+		
Baboon 58 -	Young	Each fed with 0·1 mg. of culture from Baboon 22 (Virus B. IV.).	25 days (died).		+																		
Baboon 62 -	Adult		136 days (died).	+	+		+	✦	✦	+	✦	✦	+	✦	✦	✦	+	+	+	✦		+	
Baboon 14 -	Young	Each was fed with 5 mg. of culture from G.P. 14 (Virus B. I.).	28 days (died).		+		+	+			+			+	+	+				+			
*Baboon 16 -	Adult		29 days (killed).					+			?			+	+	No lesions; G.P. became tuberculous.	+		+	+			

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* Spontaneous tuberculosis.

Animal.	Age.	Description of Experiment.	Duration of Life.	Tonsils.	Intestines.	Submaxilliary Glands.	Pharyngeal Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-colic and Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Serous Surfaces.	
																	Pleura.	Peritoneum.
Calf 38 - - -	5 months	Suckled by its mother, inoculated in the udder, for 74 days.	74 days (killed).		+				+									
Calf 86 - - -	8½ weeks	Suckled by its foster mother, Cow 74, for 190 days.	190 days (killed).		+			+	+ and one gastric gland.	+				+				
Calf 20 - - -	6 weeks	Suckled by its foster mother, Cow 18, for 33 days.	229 days (killed).		+				+		Lungs normal, pleura, tuberculous.			? one tubercle.				
Calf 50 - - -	3½ weeks	Suckled by its mother, Cow 500, for 31 days, and by its foster mother, Cow 18, for 10 days.	151 days (killed).	+	✚		✚		✚		+	+	+	+	+			
Bull 22 - - -	12 weeks	Suckled by its mother, Cow 4, inoculated in the udder, for 34 days.	363 days (killed).		✚	+	✚ (right)	+	✚	+		+		+	+		+ slight	
Calf 116 - - -	7 weeks	Suckled by its mother, Cow 68, for 47 days.	92 days (killed).		+				+		+ one tubercle.			+				

Animal.	Age.	Description of Experiment.	Duration of Life.	Portals of Entry.		Glands in connection with the Alimentary Canal.												Serous Surfaces.				
				Tonsils.	Intestines.	Submaxillary Glands.	Pharyngeal Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Peritoneum.	Pleura.	Coeliac Glands.	Other Lymphatic Glands.	—
Pig 2 - -	7 weeks -	Fed for 3 weeks with milk from Cows 500, 4 and 18.	160 days (killed).	? +	+	✦	+		✦			+	✦	+	✦	+		+	+			
Pig 4 - -	7 weeks -		264 days (killed).		+	✦			✦	✦	+	+	✦	+	✦	✦		+	+ (diaphragm).	✦	+	Tuberculous osteitis of fifth rib.
Pig 6 - -	6 months -	Fed with milk of Cow 40 for 92 days.	99 days (killed).			✦ (left)			+			+	✦	+	+	+						
Pig 8 - -	6 months -		247 days (killed).		+				+	+		+	+		+	+						
Pig 92 - -	8 weeks -	Fed once with 107 c.c. milk of Cow 172 (Virus B. IV.); containing 10 million tubercle bacilli.	137 days (killed when dying).	+		✦	+	✦	+			✦	✦	✦	✦	✦	+	+	+	✦	+	
Pig 152 -	9 weeks -	Fed with 10 mg. of culture from Virus B. XXVIII.	104 days (killed).	✦	?	✦	✦	✦	+	+	+	+	✦	+	+	✦	+ (one tubercle).	+		+	+	
Pig 154 -	9 weeks -	Fed with 1 mg. of above culture.	109 days (killed).	+		✦	✦	+	+	+	+	+	+	+	+	+						
Pig 122 -	6½ weeks -	Fed for 8 days with milk of Cow 300.	82 days (killed).	No tuberculosis.																		
Pig 128 -	7½ weeks -		75 days (killed).																			

Animal.	Age.	Description of Experiment.	Duration of Life.	Sites of Entry.			Lymphatic Gland of Alimentary Tract.														
				Tonsils.	Intestines.		Submaxillary Glands.	Retro-pharyngeal Glands.	Cervical Glands.	Gastric Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Serous Surfaces.	
					Small.	Large														Peri-toneum.	Pleura.
Dog 66 - -	6 to 9 months.	Each dog was fed with 1·0 mg. of culture from the original material of Virus B. IV.	133 days (killed).	No tuberculosis.																	
Dog 68 - -	6 to 9 months		112 days (killed).																		
Dog 84 - -	Young	Fed on January 2, 1906, with 50 mg. of culture from Dog 60 (Virus B. IX.).	73 days (killed).		?									+							
Dog 82 - -	Adult	Fed on December 15, 1905, with 32·5 mg. of culture from Dog 54 (Virus B. IV.).	91 days	No tuberculosis.																	
Dog 92 - -	Young	Fed on January 22, 1906, with 25 mg. of a glycerine serum culture from Dog 54 (Virus B. IV.).	64 days					+						+							
Dog 98 - -	Adult	Fed on February 5, 1906, with 10 mg. of culture from Virus B. X.	101 days (killed).											+ 2 tubercles			?				
Dog 100 - -	Young adult	Fed on February 6 with 10 mg. of culture from Virus IX.	100 days (killed).											+ 1 tubercle							
Dog 102 - -	Adult	Fed on March 7, 1906, with 100 mg. of culture from Virus VIII.	72 days (killed).											+ 1 nodule							
Dog 104 - -	Young	Fed on March 7, 1906, with 33 mg. of culture from Virus B. IV.	86 days (killed).											+ 2 tubercles							
Dog 106 - -	Adult	Fed on March 8, 1906, with culture from G.P. 711, Virus B. V.	90 days (killed).								?			+ 6 tubercles							
Dog 116 - -	Young	Fed with 10 mg. of culture from Dog 74 Virus B. IX.	98 days (killed).		?			+	+		+	+		+	+		+				
Cat 86 - -	Adult	Each received 10 mg. of culture from Virus B. XXVI.	71 days (killed).								?			+							
Cat 88 - -	Adult		73 days (killed).	+			+	+			+	+		+	+	+		+			

Animal.	Weight.	Description of Experiment.	Duration of Life.	Sites of Entry.			Lymphatic Glands of Alimentary Tract.												Serous surfaces.	
				Tonsils.	Intestines.															
					Small.	Large.	Submaxillary Glands.	Retro-pharyngeal Glands.	Cervical Glands.	Mesenteric Glands.	Ileo-colic Glands.	Colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Peritoneum.	Pleura.
Guinea-pig 740 -	160	Fed for 6 days with milk of Cow 44.	26 days (killed).		+					+										
Guinea-pig 741 -			26 days (killed).		+		+			+										
Guinea-pig 742 -			26 days (killed).		+					+		+								
Guinea-pig 743 -			26 days (killed).		+					+		+								
Guinea-pig 727 -		Fed for 11 days with milk of Cow 44.	11 days (died).	No tuberculosis.																
Guinea-pig 728 -			11 days (died).																	
Guinea-pig 729 -			40 days (killed).		+					+	+				+	+	+			
Guinea-pig 730 -			40 days (killed).		+		+				+									
Guinea-pig 814 -	150	Each was fed with 0·25 c.c. milk of Cow 64, containing 250,000 T.B.	114 days (killed).	No tuberculosis.																
Guinea-pig 815 -	150		18 days (died).		+	+				+	✦				✦	✦	?			
Guinea-pig 1,021 -	490	Fed from May 31, 1904, to July 22, 1904 (52 days) with milk of Cow 172 (every third day for the first fortnight and every day for the rest of the period).	52 days (killed)										+			+				
Guinea-pig 1,024 -	690		52 days (killed).											✦		+				
Guinea-pig 1,022 -	520				+					+			+	✦ (right)	+	+	✦			
Guinea-pig 1,044 -	300	Fed with 0·5 mg. of culture from G.P. 14. (Virus I.)	31 days (killed).				+		+							?				
Guinea-pig 1,045 -	360	Fed with 5·0 mg. of above culture.	31 days (killed).		+		✦			+	+	+	+		+		+			
Rabbit 53 - -	2,380	Fed with 0·5 mg. of above culture.	31 days.			+ (Appendix).							+	?						
Rabbit 54 - -	2,110	Fed with 5·0 mg. of above culture.	31 days.				+		+				+			?				

				Sites of Entry.			Lymphatic Glands of Alimentary Tract.													
Animal.	Age.	Description of Experiment.	Duration of Life.	Tonsils.	Intestines.		Submaxillary Glands.	Retro-pharyngeal Glands.	Cervical Glands.	Colic Glands.	Mesenteric Glands.	Ileo-colic Glands.	Lungs.	Bronchial Glands.	Spleen.	Liver.	Portal Glands.	Kidneys.	Serous surfaces.	
					Small.	Large.													Peritoneum.	Pleura.
Hedgehog 2 - -	Adult	Fed for 43 days with tuberculous milk of Cow 172.	43 days (killed).	No tuberculosis.																
Hedgehog 4 - -	Adult		128 days (died).					+	+											
Hedgehog 10 - -	Adult	Fed once with milk of Cow 164, dose in each ease 1,000,000 T.B.	26 days (died).	No tuberculosis.																
Hedgehog 12 - -	Adult		72 days (died).																	
Hedgehog 14 - -	Adult	Fed with E. of tuberculous organs of G.P. 1,041, inoculated with milk of Cow 172.	55 days (died).					+	+		No lesions T.B. found.				No lesions T.B. found.				+	
Hedgehog 16 - -	Adult		60 days (died).				+				No lesions T.B. found.									
Hedgehog 30 - -	Adult	Fed with culture from Virus B. XXI., each receiving 10 mg.	55 days (died).	No tuberculosis.																
Hedgehog 32 - -	Adult		52 days (died).					+												
Hedgehog 20 - -	Adult	Fed with culture from Virus B. IX., each receiving 1 mg.	47 days (killed).	No tuberculosis.																
Hedgehog 18 - -	Adult		111 days (killed).																	

ORANG 4 (Young Female).

Fed—With milk of Cow 44 for 12 days, from November 23rd, 1903, to December 5th, 1903.

Died—December 9th, 1903, 16 days after the experiment began.

Clinical History.

On the day after the experiment began the orang refused food of all descriptions; in the evening she had an attack of diarrhœa. During the next two days scarcely any food was eaten and the motions were very loose. On the fourth day there was an improvement in her condition; the appetite returned and the motions were firmer. She remained moderately well, eating, however, only small quantities of food, until December 3rd, that is 10 days after the experiment began, when she had another attack of diarrhœa; the motions consisted almost entirely of mucus. The diarrhœa continued and despite all curative measures became more acute; there was complete anorexia and the animal refused voluntarily to take food. On December 7th she vomited all the food which had been administered through a stomach tube. On December 8th she again vomited after food and was very languid, weak and ill; the temperature was subnormal. On the morning of December 9th she was very drowsy and extremely weak: the pulse was imperceptible; during the day she became more collapsed and died in the evening.

After the first day the orang refused to drink the tuberculous milk: the milk was therefore centrifugalised and the deposits from about 40 cc. were given to her daily by means of a pipette; the deposits contained numerous tubercle bacilli.

POST-MORTEM EXAMINATION.

Condition.—Muscular development poor; skin of abdomen wrinkled and loose; very little subcutaneous abdominal fat; fat more abundant on the thorax, very abundant beneath the chin; in the abdominal cavity beneath the peritoneum, around the intestines and kidneys, there were considerable deposits of fat; in the former situation on the floor of the abdomen it formed a prominent laterally undermined ridge, broad and 1 in. thick at the pubis and ensiform cartilage, narrow and thin at the umbilicus.

Tongue, Tonsils and Pharynx.—Normal.

A little secretion from a tonsillar crypt was examined microscopically; cocci and bacilli (stained blue) were seen, but no tubercle bacilli.

Submaxillary and Retro-pharyngeal Glands.—Normal.

Cervical Glands.—Left upper cervical gland, not apparently enlarged, showed two minute whitish specks just visible to the naked eye; sections were prepared to ascertain whether these were early tuberculous foci (see microscopical examination). The cervical glands on the right side were normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Small Intestine.—A large round worm was found in the duodenum near the pylorus. Eight inches from the pylorus there was a patch of rather prominent and firm discrete lymphoid nodules, each the size of a pin's head; a smear preparation was made from one of these, but no tubercle bacilli were found. A short distance further along a Peyer's patch showed a minute point, more opaque than the surrounding lymphoid tissue; in a smear from this also no tubercle bacilli were found. The mucous membrane of the small gut was elsewhere normal in appearance.

Large Intestine.—The cæcum and colon contained no fæces. Towards the lower end of the colon a trichocephalus dispar was seen in the mucous membrane. A few inches above the anus there was a small superficial erosion of the mucous membrane.

Spleen.—Very dark and firm; otherwise normal.

Liver.—Surface smooth; substance pale, soft and fatty; on the anterior surface of the right lobe there was a yellowish or dirty white area, ⅗ in. in diameter; on section it was a somewhat wedge-shaped mass extending ½ in. into the substance; it had a fairly sharp irregular outline, did not project from the surface and by touch could not be differentiated from the surrounding liver substance (? infarction).

Kidneys.—Pale and fatty.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—The base of the left lower lobe was congested and œdematous, exuding on section frothy fluid; pieces floated in water; there was no sign of tuberculosis.

Thoracic Lymphatic Glands.—Normal.

Heart.—Normal.

Pleura and Diaphragm.—Normal.

Brain and Meninges.—Normal.

GUINEA-PIGS INOCULATED.

Number.	Material used.	Method.	Duration of Life.	Killed or Died.	Result.
744	Mesenteric glands	Subcutaneous	77 days	Killed	Healthy
745		Intraperitoneal	75 „	„	„
746	Liver	„	77 „	„	„
747	Lung	„	1 day	Died	Acute infection
748	Spleen	„	51 days	Killed	Healthy

Microscopical Examination.

Smear Preparations.—A smear from the mesenteric gland emulsion showed one ? tubercle bacillus. In smears from the intestine and tonsil no tubercle bacilli were found.

Paraffin Sections.—Series of sections taken from different parts of the left cervical gland were examined, but no tubercle bacilli or structures suggestive of tuberculosis were seen; the sections showed in the lymph spaces at the periphery of the gland numerous large bacilli stained blue. A number of sections from a retropharyngeal gland also showed no tubercle bacilli.

ORANG 8.

Fed—With culture derived from Cow 44. Virus B. I.

Dose—0·01 milligramme.

Date—April 3rd, 1904.

Died—April 9th, 1904, 6 days later.

Clinical History.

Towards the end of March she began to have frequent attacks of diarrhœa, and took very little food; she occasionally vomited; the motions often consisted entirely of mucus. The diarrhœa persisted, small quantities of whitish mucus being constantly passed per rectum, and she died on April 9th, 6 days after the experiment began.

POST-MORTEM EXAMINATION.

Condition.—Body wasted but still showed considerable deposits of fat in the abdomen.

Small Intestine.—Normal.

Large Intestine.—The mucous membrane of the large intestine throughout its whole length showed numerous small ulcers which in many places had become confluent; the ulcers involved the whole thickness of the mucous membrane, but there was no appreciable thickening of the muscle wall; the mucous membrane between the ulcers was thickened and congested. There were no intestinal parasites.

Mesenteric Glands.—Normal.

Lungs.—Showed a few small patches of congestion—otherwise normal.

All other organs and glands were normal in appearance.

Guinea-pigs Inoculated.

Guinea-pigs were inoculated with emulsions made from a precardiac gland, a retro-pharyngeal gland and the mesenteric glands; all remained healthy.

Cultures.

Agar tubes were sown from the mucus in the large intestine and numerous colonies of a capsulated bacillus were cultivated.

CHIMPANZEE 2.

Fed—With culture derived from the original material of Virus B. IV. (The culture was the 16th generation, 20 days old; its total age was 420 days.)

Dose—1·0 milligramme.

Date—October 31st, 1904.

Died—December 26th, 1904, 56 days after feeding.

Clinical History.

The chimpanzee remained perfectly well until December 15th, when he was noticed to be quieter than usual; on this date there was a sour odour about his mouth as if he had been recently vomiting, but no vomit was seen in the cage. Two days later he was seen to vomit immediately after the morning meal. His appetite then began to diminish and he became obviously thinner and feebler. The weakness increased and slight diarrhœa supervened.

He died rather unexpectedly on December 26th, 1904, fifty-six days after feeding.

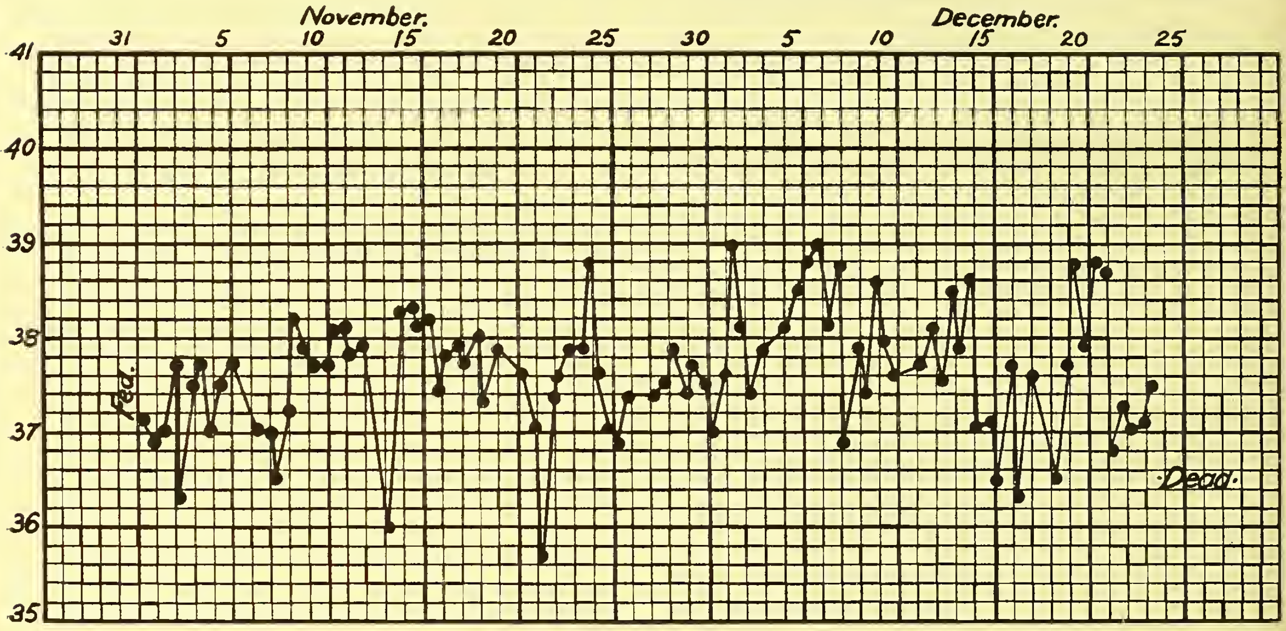
Weights.

November 7th, 1904	- -	9 lbs. 12 ozs.
November 23rd, 1904	- -	10 lbs. 2 ozs.
December 12th, 1904	- -	10 lbs. 6 ozs.
December 20th, 1904	- -	9 lbs. 0 ozs.
December 26th, 1904	- -	8 lbs. 12 ozs.

Gained 10 ozs. in the first five weeks, and lost 1 lb 10 ozs. in the last fortnight.

Loss of weight on the initial weight, 1 lb.

Temperature.



POST-MORTEM EXAMINATION.

Body.—Thin, but not emaciated.

Mouth, Tongue, Pharynx, Tonsils, Retropharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum. Peritoneum, Stomach.—Normal.

Small Intestine.—In the small intestine thirty ulcers were counted; at the anterior end they were quite superficial, each being merely a slight abrasion in the centre of a raised patch of mucous membrane; lower down, where they were most numerous, they were definite ulcers up to a third of an inch in diameter, with raised edges; the ulcers were situated in Peyer's patches.

There were three round worms in the small intestine, one being in the vermiform appendix.

Large Intestine.—There were some small indurated patches in the large intestine, but these were not definitely ulcerated.

Mesenteric Glands.—Were enlarged and somewhat confluent, forming a lobulated mass of considerable size (two inches long). Section showed them to contain caseating nodules.

The glands of the large intestine and those of the rectum contained caseous foci.

Spleen.—Measured $2\frac{3}{4}$ in. × $1\frac{1}{4}$ in. × $\frac{1}{2}$ in.: normal on the surface. On section three little whitish pin-point tubercles were seen in it.

Liver.—Normal.

Portal Gland.—There was no gland in the small omentum.

Thorax :

Kidneys, Suprarenal Bodies.—Normal.

Heart, Pleura.—Normal.

Lungs.—Apex of left lung adherent; on the right side the upper lobe contained three tubercles, about the size of a pin's head, with caseous centres and translucent peripheries; there was about the same number in the mid lobe, and in the lower lobe about half a dozen larger than the above (an eighth of an inch or rather more in diameter); besides the larger ones there were several smaller ones similar to those in the other lobes. Left upper lobe was similarly affected, about four tubercles being counted in it.

Left lower lobe normal.

Bronchial Glands.—One at the root of the right lung contained caseous foci. The glands around the left bronchus were normal, with the exception of one which contained a caseous focus.

Testes, Inguinal Glands, Iliac Glands, Lumbar Glands.—Normal.

Microscopical Examination.

Spleen	- - - - - - -	3 T.B.
Tonsil	- - - - - - -	No T.B.

CHIMPANZEE 6.

Fed for one week with milk of Cow 172 (Virus B. IV., Table 4).

The milk, which was much altered in quality, was the mixed product of the two inoculated quarters of the cow; it was given night and morning, in amounts varying from 70 to 90 cc., with about equal parts of normal sterile milk.

The feeding began on October 29th, and ceased on November 4th; during this time 1,000 c.c. of the infected milk were drunk.

An exact estimate of the number of tubercle bacilli present in the tuberculous milk was not made, but if they continued to be present in the same proportion as they were in the milk used to feed Chimpanzee 8 on October 28th, Chimpanzee 6 would have received altogether about 100,000,000 tubercle bacilli.

The Chimpanzee was killed on February 6th, 1905. 100 days after the experiment began.

Clinical History.

The chimpanzee showed no sign of illness until December 28th, when he was noticed to be quieter and less active than usual.

On December 31st he had a sharp attack of diarrhœa, which continued for three days, and then abated somewhat.

During the month of January the appetite was moderately good, yet the animal became progressively thinner and weaker. The condition of the motions varied; they were generally loose, but only occasionally was diarrhœa marked. Slight œdema of the eyelids appeared about the middle of the month.

On January 30th the severity of the symptoms had become greatly increased; the œdema of the eyelids was more marked: the skin of the face and the mucous membrane of the mouth was extremely pale; there was a hernial protrusion of the gut into the umbilicus; the motions were offensive.

During the next few days weakness and wasting became extreme and on February 6th he was scarcely able to crawl about the cage; his cheeks and eyelids were very puffy and there was practically no inclination for food; a little milk was taken in the morning, but most of this was vomited a short time afterwards.

His general appearance was such as to make it appear improbable that he would live more than a day, or at most two days, longer; he was therefore chloroformed and examined.

Weights.

November 7th,	1904	- -	12 lbs.	0 ozs.
November 23rd,	1904	- -	12 lbs.	6 ozs.
December 12th,	1904	- -	11 lbs.	12 ozs.
December 20th,	1904	- -	12 lbs.	4 ozs.
January 10th,	1905	- -	11 lbs.	0 ozs.
January 24th,	1905	- -	10 lbs.	12 ozs.
February 6th,	1905	- -	9 lbs.	12 ozs.
Loss in weight on the initial weight		- - - - -	2 lbs.	4 ozs.

POST-MORTEM EXAMINATION.

The body was extremely emaciated; the muscles were atrophied and flabby and there was an entire absence of subcutaneous fat.

Tonsils, Pharynx, Submaxillary Glands, Retropharyngeal Glands, Cervical Glands.—Normal.

Abdomen.

The peritoneal cavity contained from 10 to 15 c.c. of clear serous fluid.

Omentum.—Was oedematous, devoid of fat, and showed moderately numerous pearly tubercles, ranging in size from a point just visible to the naked eye to that of a mustard seed.

Parietal Peritoneum.—Normal.

Stomach.—The mucous membrane was congested, but there was no ulceration.

* *Small Intestines.*—The mucous membrane of the small intestine showed throughout its whole extent very numerous typical tuberculous ulcers (125 were counted); they were most numerous in the upper part of the gut, where in several instances two neighbouring ulcers were seen to have become united; they ranged in size from a quarter to over half an inch in diameter and had slightly raised thickened margins; some of the largest ones were almost circular in outline, but the majority were irregular, and many were elongated in a direction transverse to the length of the bowel.

In the ileum the ulcers were situated in Peyer's patches. These ulcers showed definite caseation at the base and under the edges, but no peritoneal tubercles; the ulcers in other parts of the intestine showed little or no caseation and had only slightly thickened bases; on the serous surface of almost all the latter ulcers there were colonies of hard translucent tubercles and in two or three cases long strands of connective tissue.

Large Intestine.—The mucous membrane of the large intestine showed from twelve to fifteen ulcers, the largest about a quarter of an inch in diameter.

The mesentery was slightly oedematous; the lacteal vessels were not thickened nor distended.

The mesocolon was very oedematous, particularly along the line of its attachment to the large bowel.

Gastric Glands.—Normal.

* *Mesenteric Glands.*—All the mesenteric glands were enlarged; they varied in size from that of a pea to that of a marble (nearly half an inch in diameter). On section they consisted practically throughout of dense yellowish white caseated tissue. The glands were moveable one over the other and under the peritoneum.

The pyloric gland, the glands around the head and body of the pancreas and the ileo-colic glands were similarly affected (the ileo-colic glands, however, showed a larger amount of grey translucent tissue than the other glands).

Colic Glands.—Most of the colic glands were enlarged, some being nearly 1 centimetre in diameter; the largest ones were caseous throughout; the medium sized ones were partly caseous, and a few of the smaller ones showed irregular caseous foci.

The Lumbar Glands were slightly enlarged; one was caseous in the greater part of the cortex; the others showed small caseating tubercles.

Liver.—The liver substance was soft and very pale in colour; no tubercles were seen on the surface or on section.

Gall Bladder.—Normal.

Portal Gland.—(Situated in the hilum of the liver) not enlarged: normal on section.

Spleen.—The spleen was not obviously enlarged On section sparsely scattered caseous tubercles, mostly about the size of a No. 4 shot, were seen in the pulp. A few of the tubercles that lay immediately under the capsule caused slight projections on the surface; the capsule at these points was congested, and covered by a delicate film of fibrin. One of the larger tubercles formed a hemispherical projection and over this the capsule was thickened.

An accessory spleen, the size of a pea, contained a pinhead-sized caseous tubercle.

A small gland in the gastro-splenic omentum showed a caseous focus.

Kidneys.—Intensely anæmic; on the surface of the right three pale grey spots were seen; on section they were not easily differentiated from the surrounding kidney substance, and it appeared doubtful whether they were tubercles. (Reserved for microscopic examination.)

The left kidney showed a similar spot.

Suprarenal Bodies, Iliac Glands.—Normal.

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* See Plate 1.

Thorax :

Pleura.—Normal.

The pericardial sac contained a few cubic centimetres of clear serous fluid.

The pleural cavities contained about fifty cubic centimetres of clear serous fluid.

Lungs.—Free from adhesions; contained a moderate number of hard grey tubercles, mostly about the size of pins' heads ; a few, however, were as much as two millimetres in diameter, and one in the depth of the left caudal lobe was the size of a pea. The tubercles showed only a very slight amount of central necrosis.

In the right upper and middle lobes there were some old patches of collapse.

Bronchial Glands.—Did not appear to be enlarged. One below the left bronchus showed an opaque tubercle; the others were normal on section.

Mediastinal Glands.—The dorsal mediastinal glands (two near the diaphragm) contained caseous foci.

Axillary Glands, Inguinal Glands, Testicles.—Normal.

Brain.—There was a large amount of fluid in the cranial cavity ; the membranes and the substance of the brain were normal.

Microscopical Examination.

Mesenteric Gland Emulsion.—Tubercle bacilli numerous.

Accessory Spleen.—No tubercle bacilli found.

Lumbar Gland.—Tubercle bacilli moderately numerous.

Smear preparations made from the blood showed the xanthocytes aggregated together in grape-like masses, and an apparent increase in the number of the polymorpho-nuclear leucocytes.

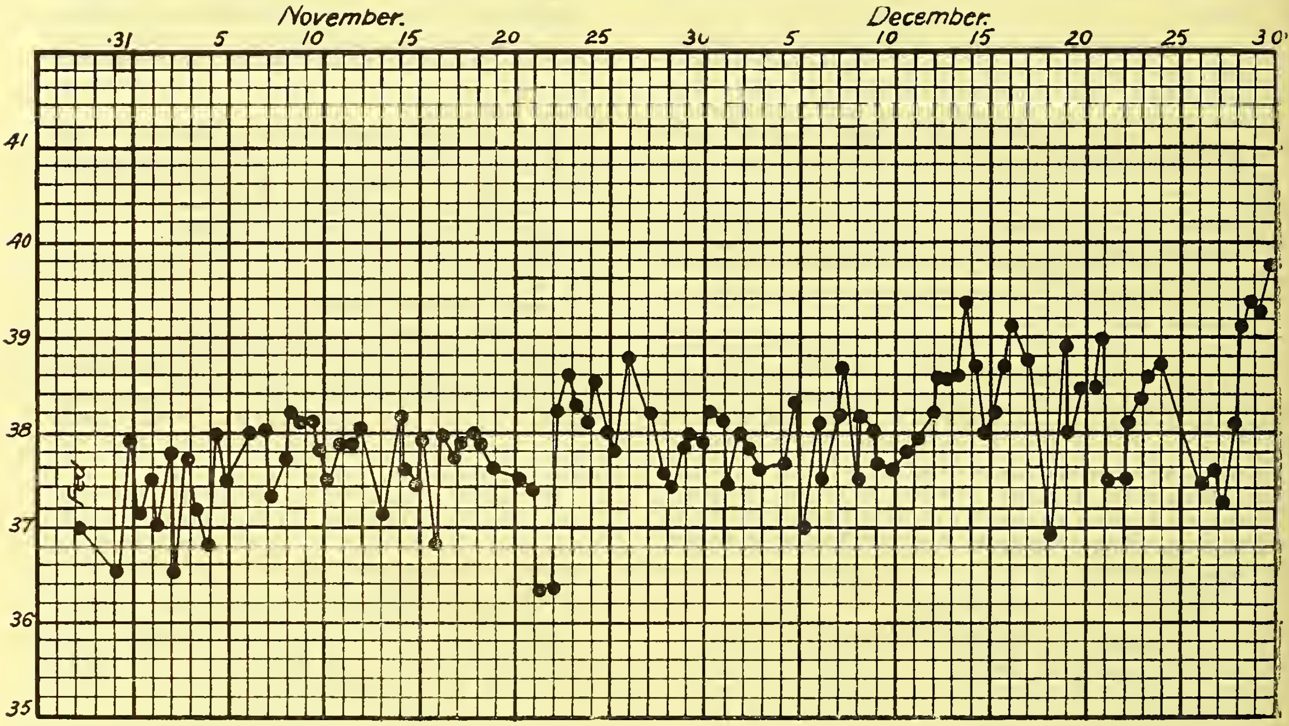
Guinea-Pigs Inoculated (all intraperitoneally).

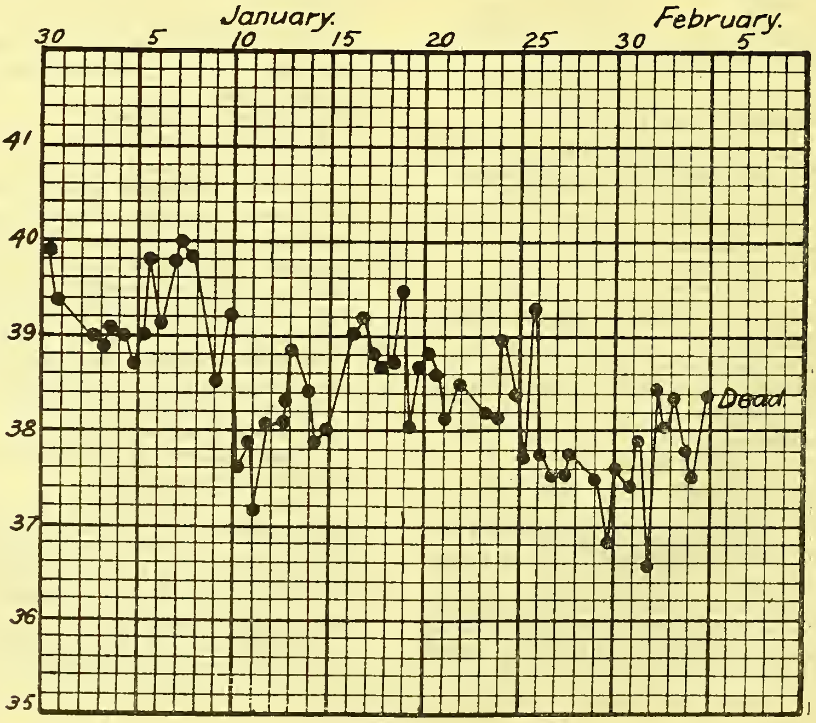
Guinea-pig 1428, inoculated with an emulsion made from the liver, died in 58 days of general tuberculosis.

Guinea-pig 1429, inoculated with an emulsion from a mesenteric gland, died in 32 days of general tuberculosis.

Guinea-pig 1430, inoculated with 4 c.c. peritoneal fluid, died in 103 days of general tuberculosis.

Temperature.





CHIMPANZEE 8.

Fed once on October 25th, 1904, with tuberculous milk of Cow 172.

Amount of Milk—107 cc.

Number of Bacilli—10,000,000.

The milk was taken from the two inoculated quarters of the cow and was collected on the 26th, 27th, and 28th; of that collected on the 26th only the deposit, which consisted almost of pure pus, was used; the different samples were thoroughly mixed together and then filtered through muslin; the filtrate was estimated to contain 94,500 T.B. per cc.

Died March 14th, 1905, 144 days after the experiment began.

Clinical History.

Except for occasional slight colds in the head, characterised by nasal discharge and sneezing, which were cured by small doses of ammoniated tincture of quinine, the chimpanzee remained perfectly well until March 14th, 1905. On this date she appeared to have caught fresh cold; quinine was administered without any alleviation of her symptoms. On the 16th she was obviously ill; she was less lively and the respirations were increased in frequency. On the next day there was no improvement; she lay in one place practically the whole day, eating very little solid food, but drinking milk greedily; the respirations were 56. On the 18th and 19th her condition remained about the same. On the 20th she was thought to be a little better; she was, however, in a very irritable state, screaming and biting when touched or lifted out of the cage.

On the morning of the 21st there was no change in her general appearance; her temperature was taken in the usual way and five minutes after being put back in her cage she suddenly died.

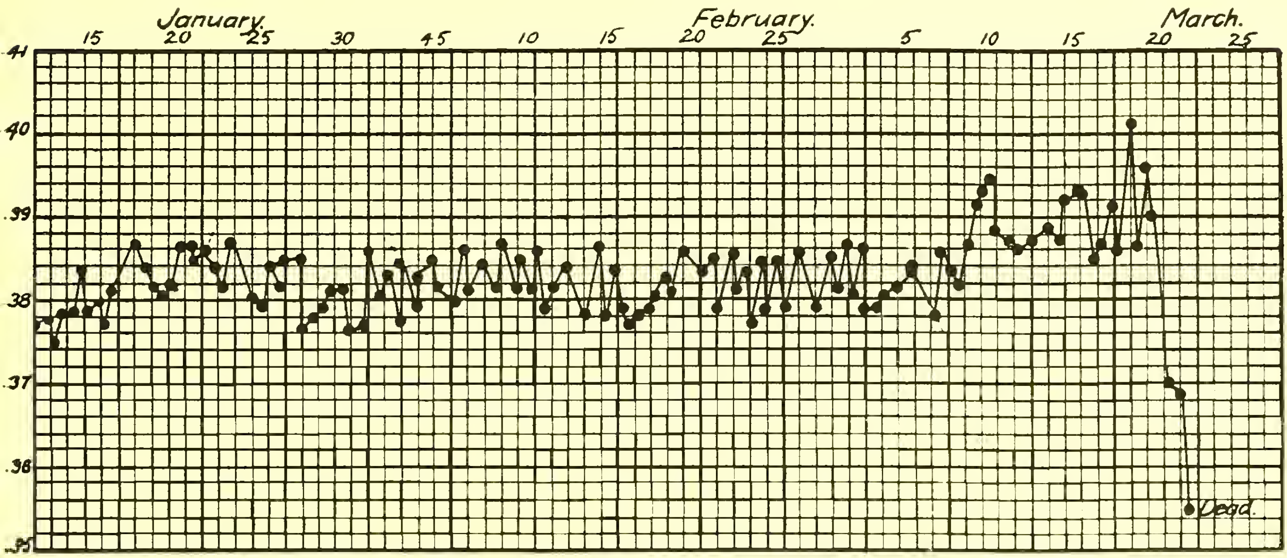
Duration of the Experiment.—One hundred and forty-four days.

Weights.

November 7th, 1904	- -	14 lbs.	0 ozs.
November 23rd, 1904	- -	15 lbs.	4 ozs.
December 12th, 1904	- -	16 lbs.	4 ozs.
December 20th, 1904	- -	16 lbs.	8 ozs.
January 1st, 1905	- - -	17 lbs.	4 ozs.
January 24th, 1905	- -	19 lbs.	2 ozs.
February 7th, 1905	- -	19 lbs.	4 ozs.
February 21st, 1905	- -	19 lbs.	14 ozs.
March 8th, 1905	- - -	21 lbs.	2 ozs.
March 21st, 1905	- - -	17 lbs.	14 ozs.

Gain in weight from November 7th, 1904, to March 8th 1905, 7 lbs. 2 ozs.; loss in weight during the last 13 days 3 lbs. 4 ozs.

Temperature.



POST-MORTEM EXAMINATION.

Body in moderately good condition; there was a good amount of subcutaneous fat and the muscles were firm and well developed

Tongue, Tonsils and *Pharynx*.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Abdomen :

Omentum and Parietal Peritoneum.—Normal.

Stomach.—Normal.

Small Intestine.—Nine inches from the pylorus the mucous membrane showed a small ulcer with raised undermined edges and fibroid base studded with caseous foci; under the mucous membrane around the ulcer there were three or four caseous tubercles.

In the upper part of the middle third of the intestine there was a similar but smaller ulcer; the thickened base of this ulcer formed a marked projection on the serous surface.

A little further along there was a congested ulcer 1 cm. in diameter with raised considerably undermined margins and thickened base; on the serous surface for a good distance around the ulcer there was an eruption of pearly grey miliary tubercles.

Just beyond the middle of the gut there was a large circular ulcer, 2 cm. in diameter, with raised congested undermined margins, smooth red floor and thick fibroid base beset with caseous foci; the base of the ulcer was 5 mm. in thickness and was seen on the serous surface as a slightly elevated greyish yellow patch.

A Peyer's patch beyond this showed a few opaque whitish foci.

One foot from the ileo-coecal valve there was a congested ulcer nearly 1 cm. in diameter with necrotic floor and caseous base; on the peritoneal surface there were a few small tubercles.

The patch four inches from the ileo-coecal valve was a little congested and contained four opaque white foci; the terminal Peyer's patch was congested, but was otherwise normal.

Large Intestine.—The mucous membrane of the cæcum and colon showed numerous small erosions, occurring mainly on the summits of the valvulæ conniventes.

Gastric Glands.—Normal.

Mesenteric Glands.—Nine glands showed a slight degree of enlargement; on section they contained dense fibroid nodules, some of which nearly filled the glands, whilst others were quite small and discrete; the nodules were caseous in the centre and appreciably gritty from calcification; there was no sign of softening; the capsules of the glands over some of the larger nodules were thickened and fibroid; the rest of the mesenteric glands, eight to ten in number, were normal.

Ileo-colic Glands.—Normal.

Colic Glands.—In the meso-colon, just below the splenic flexure, there was a group of three glands, the largest nearly 1 cm. in diameter, the smallest, smaller than a pea; the two larger glands were practically caseous throughout; they were beginning to soften in the centre and were slightly gritty around the margins; the smallest gland contained two dense gritty caseous nodules occupying about half the substance.

Other colic glands were normal.

In the muscle wall of the abdomen just under the last rib on the left side there was a fluctuating tumour the size of a hen's egg; it formed a marked projection into the abdominal cavity and to it the wall of the large intestine below the splenic flexure was intimately adherent; on section the tumour was found to consist of a series of cavities of various sizes filled with brownish yellow pus; the cavities communicated one with another by small openings and were surrounded by walls of fibrous tissue. No communication with the interior of the gut could be demonstrated, the mucous membrane at this part having a perfectly normal appearance.

Glands around Pancreas.—Normal.

Spleen.—Normal on the surface and on section.

Lymphatic Gland in Hilum of Spleen.—Normal.

Liver.—Somewhat pale, showed no sign of tuberculosis.

Gall Bladder.—Distended with bile.

Portal Gland.—Normal.

Kidneys.—Pale, otherwise normal.

Suprarenal Bodies—Normal.

Thorax.

Heart and Pericardium.—Normal.

Pleura.—Normal.

Lungs.—The lungs were fuller than normal; there were no adhesions; the margins of the lobes were emphysematous.

Left Lung.—At the apex of the left upper lobe there was a rounded patch of consolidation; this was dark red externally and greyish red in the centre; the lower flap of this lobe was red collapsed and quite airless; on the surface there were numerous slightly elevated greyish foci (resembling tubercles) which when cut into were found to contain a soft greyish white purulent material.

The upper and anterior part of the basal lobe was in a similar condition; the rest of the lobe had a more or less normal appearance on the surface, but on section in the depth of the lobe small greyish areas were seen.

Right Lung.—At the apex of the right upper lobe there was a patch of consolidation similar to that in the left; the lower tongue-shaped portion of this lobe, the right middle lobe and the upper part of the lower lobe (around the root) were red and consolidated resembling the left upper lobe; the dorsal surface of the lower lobe showed also several nodules of recent pneumonia which in places had a greyish appearance on section.

Bronchial Glands.—The left praetracheo-bronchial gland was enlarged; on section the central part was broken down and contained a collection of greyish purulent material. Other bronchial glands were enlarged but not softened.

Brain.—Meninges congested; cerebro-spinal fluid much increased in amount; no tubercles seen on the membranes.

Uterus and Ovaries.—Normal.

Axillary, Inguinal and Iliac Lymphatic Glands—Normal.

Microscopical.

Mesenteric Gland.—A few T. B.

Colic Gland.—A few T. B.

Small Tubercle in Peyer's Patch.—1 T. B.

Lung (Consolidated Patch).—No T. B.

Left Bronchial Gland.—No T. B.

Pus from Abscess.—No T. B.; a few bacilli-stained blue.

Cultures were sown from a mesenteric gland nodule and from one of the solid patches in the lung.

On the next day all the tubes sown from the lung showed numerous small transparent colonies and a few large soft whitish colonies.

A smear made from the small colonies showed a diplococcus. A pure culture was isolated and inoculated into two mice.

Both mice died in 36 hours and numerous capsulated diplococci (pneumococci) were seen in smear preparations made from the blood.

The large colonies sown on glucose litmus broth formed acid and gas in 24 hours.

CHIMPANZEE 14.

Fed on September 11th, 1905, with about 1·1 milligramme of culture derived from the original material of Virus B IX.

(The culture was twenty days old, twentieth generation, and was grown on bovine serum.)

The culture suspension was pipetted into the mouth of the Chimpanzee, and owing to the animal sucking the pipette, a little more than 1 cc. was delivered.

The Chimpanzee died on November 13th, 1905, 63 days after it was fed.

Weight.

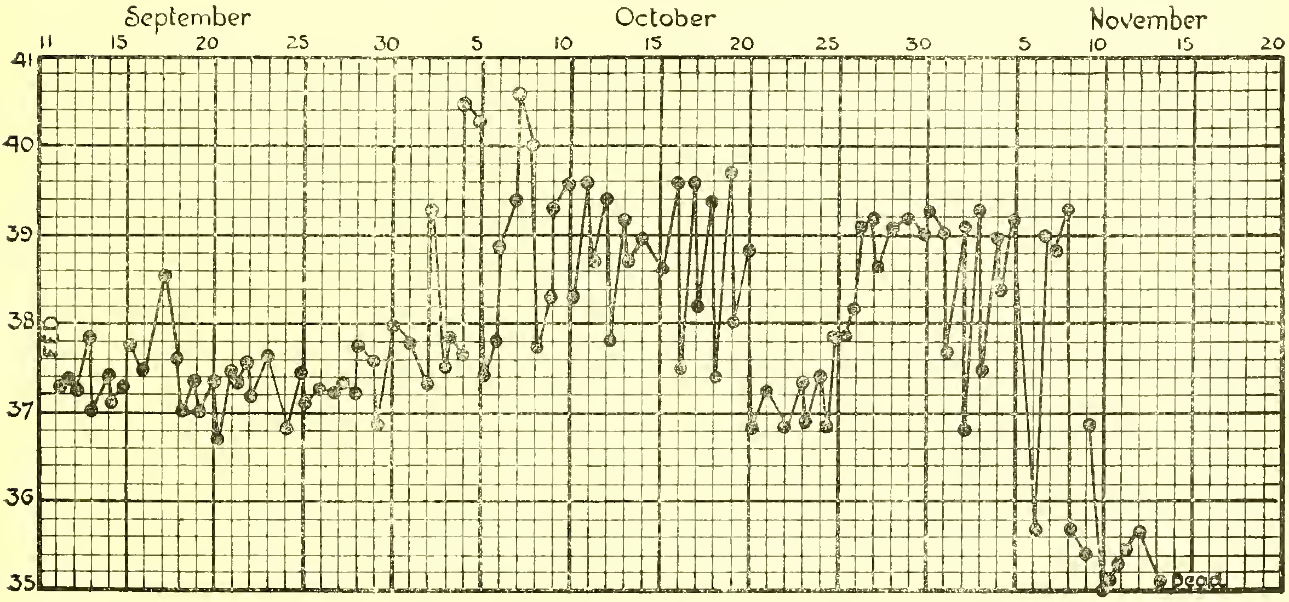
September 12th, 1905	- -	16 lbs.	8 ozs.
October 5th, 1905 -	- -	17 lbs.	4 ozs.
October 10th, 1905	- -	16 lbs.	10 ozs.
October 24th, 1905	- -	14 lbs.	10 ozs.
November 13th, 1905	- -	12 lbs.	7 ozs.

Loss in weight on initial weight, 4 lbs. 1 oz.

Clinical History.

There was a sudden onset of illness with the rise in temperature; he was depressed, quiet and irritable, and lost appetite. These symptoms continued throughout the month of October and there was appreciable loss of flesh; occasional diarrhœa was noticed; there was no cough, and no increase in respiration. Corresponding approximately with the period of apyrexia there was a distinct improvement in the condition for a few days; he was much brighter, more active, and showed increased appetite, but was obviously much thinner than at the beginning of the experiment. On November 10th he again became acutely ill; he was very weak and irritable and refused solid food, but drank a moderate amount of milk. He rapidly became worse, and died on November 13th, 1905 at 11 a.m., 63 days after being fed. During the last two days of life practically no food was eaten and he became very weak and emaciated. Œdema of the eyelids was first noticed on November 10th, and persisted until the end of the experiment.

Temperature.



POST-MORTEM EXAMINATION.

Body.—Somewhat emaciated.

Tonsils.—The substance of the left tonsil was normal; in the subtonsillar tissue, near the soft palate, there was a small cavity containing yellow pus.

Right tonsil normal.

Submaxillary Salivary and Lymphatic Glands, Parotid Salivary and Lymphatic Glands, Retropharyngeal Lymphatic Glands.—Normal.

Cervical Glands.—In the right anterior triangle, near the angle of the jaw, there was a mass, measuring about one inch by two-thirds of an inch by one-third of an inch, composed of two glands fused together; one of these was caseous almost throughout; the other was partly caseous.

A small gland posterior to and deeper than the latter contained four soft white caseous tubercles, each one millimetre in diameter. Along the posterior border of the right jugular vein there was a chain of slightly enlarged œdematous glands, five of which contained opaque whitish softened caseous tubercles, the largest 1·5 millimetre in diameter. One gland, a little larger than the others, showed about half a dozen or more tubercles; the rest contained a smaller number.

Two small glands in the left anterior triangle contained each a few soft white miliary caseous tubercles, other glands in the triangle and all about the jugular vein were slightly œdematous, but otherwise normal.

A small gland or two under each clavicle was normal.

Abdomen.

The intestines were adherent in several places to the anterior abdominal wall.

The peritoneal cavity contained a large amount of slightly turbid yellow serous fluid.

Omentum.—Was adherent to the small intestines, which were matted together by firm adhesions; the intestine was firmly adherent to the bladder, separation causing the wall of the former to be torn.

The omentum was very œdematous and contained very numerous transparent glistening tubercles, the largest a little less than 1 millimetre in diameter, and a few greyish white miliary tubercles with congested margins.

Peritoneum.—The parietal peritoneum showed, chiefly on the anterior wall, numerous transparent tubercles, the largest the size of a pin's head, quite perceptible to the touch.

There were numerous transparent miliary tubercles on the mesocolon.

Stomach.—Normal.

Small Intestine.—The small intestine was very severely affected. The mucous membrane showed throughout its entire length extremely numerous ulcers: most of these were small, having probably originated in the solitary follicles, and had congested slightly raised margins and caseous base. Towards the lower end of the intestine the ulcers became larger, some attaining an area of 2 by 1·5 cm. The larger ulcers were situated in Peyer's patches; they had raised irregular congested margins, showing in some cases a yellowish appearance around the edges, and thickened bases, by which they were adherent to surrounding structures. The floors were granular and showed yellow foci, or were irregular necrotic and congested. In some cases ulceration extended beyond the limits of the lymphoid patch: the terminal patch was very thickened and raised and showed a number of irregular ulcerations. Scattered about in the wall of the intestine were numerous yellow caseous nodules, over which the mucous membrane was intact.

On the serous surface of the intestine there were numerous subperitoneal tubercles, most numerous opposite the large ulcers.

Large Intestine.—The cæcum showed a number of small congested ulcers with very little caseation; on the serous surface there were a few congested tubercles. The colon showed numerous congested patches in the mucous membrane, but no definite ulcers.

Gastric Glands.—A precardiac gland was enlarged, but contained no caseous foci: other gastric glands were normal.

Mesenteric Glands.—The mesenteric glands were all much enlarged and encroached considerably on the mesentery; the mass produced by these glands was thrown into folds, which at several points were adherent to each other. The vermiform appendix was firmly adherent to the mass. On section the glands showed advanced caseation; some of the glands were caseous throughout, but in the majority the whole of the cortex was replaced by white or creamy-white caseous material, but not broken down into pus. Many of the glands adhered together by their capsules.

Ileo-colic Glands.—Were enlarged and similarly though not so severely affected.

Colic Glands.—Six colic glands at various parts of the large intestine were affected. One, the size of a small pea, was caseous throughout, two were partly caseous, and three contained each a caseous tubercle. All the other numerous small glands along the margin of the intestine were slightly enlarged, œdematous and congested but not obviously tuberculous.

The mesentery was œdematous and much shortened in the upper part, the intestine in several places coming almost into contact with the enlarged mesenteric glands. A few scattered miliary caseous tubercles were seen.

Near the duodenum, under the head of the pancreas, there was a group of three enlarged glands; two were partly caseous; the third was beset with firm opaque caseous tubercles.

The Spleen was enlarged, 3 in. x 1$\frac{2}{3}$ in. x $\frac{1}{3}$ in, and showed on the surface a number of slightly raised flattened deeply congested tubercles, mostly about one millimetre in diameter, one was a little larger (two millimetres), and had a yellow centre. In the pulp there were sparsely scattered soft yellowish tubercles, majority one millimetre or less in diameter, and one irregular soft caseous nodule, larger than a wheat grain.

Two glands in the hilum of the spleen were slightly enlarged and beset with small caseous tubercles.

The Liver was very pale and showed on the surface scattered filmy grey tubercles with overhanging margins, and one or two with slightly opaque centres. In the substance, through the capsule, fairly numerous minute dark grey specks were seen. On section the grey points could not be made out; one opaque greyish white tubercle, the size of a shot, was seen.

Portal Glands.—Normal.

The Kidneys were pale and seemed enlarged. The capsules were slightly adherent; in the cortex of the left there were moderately numerous grey miliary tubercles, some slightly opaque in the centre.

The right kidney showed similar tubercles; some projected above the surface.

Suprarenal Bodies.—Normal.

Thorax.

Heart.—Normal.

Pleura.—Parietal pleura normal. On the pleural surface of the diaphragm, chiefly on the right side, there was a number of flattened filmy transparent growths. A small gland in the caval fold of pleura contained a minute caseous tubercle.

Lungs.—The left lower lobe was adherent to the diaphragm and lower part of chest wall by fairly recent fibrous adhesions.

The left lung was congested; both were crepitant and contained sparsely scattered grey miliary tubercles, with opaque caseous centres.

Trachea.—Normal.

Larynx.—False vocal chords deeply congested.

Bronchial Glands.—One prætracheo-bronchial gland on the right side contained a soft caseous tubercle about 1·5 millimetre in diameter. Other bronchial glands were normal.

Mediastinal Glands.—Two slightly enlarged dorsal mediastinal glands contained numerous pin-head-sized caseous tubercles; another gland contained one tubercle; others were not obviously tuberculous.

Lumbar Glands, Iliac Glands, Inguinal Glands, Axillary Glands, Brain, Testicles.—Normal.

Microscopical Examination (Smears).

Cervical Gland	Numerous tubercle bacilli.
Mesenteric Gland	
Ileo-colic Gland	
Bronchial Gland	
Cervical Gland (small one on right side)	
Duodenal Gland	

Spleen.—Two tubercle bacilli.

Liver.—Two tubercle bacilli.

Left Tonsil (scraping from surface).—A few tubercle bacilli.

Subtonsillar Abscess.—A few tubercle bacilli, numerous organisms stained blue and many clumps of long slender bacilli, slightly acid-fast.

Animals Inoculated.

Guinea-pig 1774, inoculated with an emulsion made from a mesenteric gland, died of tuberculosis.

Guinea-pig 1775, inoculated with an emulsion made from a cervical gland, died of tuberculosis.

Guinea-pig 1773, inoculated with an emulsion made from the liver, died of tuberculosis.

Rabbit 512, inoculated intraperitoneally with an emulsion made from an ileo-colic gland, died in 54 days of general tuberculosis.

RHESUS MONKEY 62.*

Fed with Milk of Cow 74 from June 29th, 1903, to September 2nd, 1903, a period of 65 days.

Total amount of Milk Consumed = 9,785 cubic centimetres.

Age when the Experiment began—about eleven weeks.

Killed—September 8th, 1903. 71 days after the experiment began.

Clinical History.

This monkey was born at sea on or about the tenth of April 1903; he was tested with tuberculin at the Quarantine Station with a negative result.

The monkey very greedily drank the infected milk, plunging mouth and nostrils into the fluid and consuming sometimes the whole quantity given to him, from 75 to 100 cubic centimetres, without taking breath; as a result on several occasions he was observed to cough and choke as if some of the fluid had been drawn into the larynx. The milk was given to the monkey in a small trough and his affection for the latter became so great that he was inconsolable whenever it was taken away from him; he was allowed to have it constantly in his cage and he was accustomed to sleep curled up in it at night.

These details in the history of the animal are given to show that there is the possibility that tubercle bacilli may have got to the lungs by way of the bronchi, either by insufflation or by inhalation.

Tubercle bacilli could always be found in the centrifugalised deposits from the milk but were never very numerous.

The animal remained in excellent condition until about the middle of August when he began to show slight signs of ill-health—staring coat, loss of appetite, hurried respiration on slight exertion and a less lively and playful habit. He gradually got worse; the appetite became poor; ordinary quiet respiration was much increased, the accessory respiratory muscles being brought into action; there was also apparent some loss of flesh. The temperature was not taken during the experiment; on the day he was killed the temperature was 105°F.

POST-MORTEM EXAMINATION.

The animal showed some subcutaneous fat in the abdominal wall.

No fluid; no peritonitis; no tubercles on peritoneum.

Tongue, Tonsils, Larynx, Pharynx.—Normal

Cervical Glands, Retro-Pharyngeal Glands.—Normal.

Intestines.—Normal throughout. No ulceration of mucous membrane. No nodules, either in mucous membrane or on peritoneal surface. Peyer's patches normal.

The colon contained yellow fairly firm fæces.

Colic Glands.—In mesocolon, near rectum, was one enlarged lymphatic gland, showing a projecting yellow tubercle. The remainder of the colic glands appeared to be normal.

One gland at the junction of ileum and cœcum showed a small nodule of tubercle in its substance.

Mesenteric Glands.—Not obviously enlarged, showed no visible tubercles. (Reserved for microscopic examination.)

Liver.—Not enlarged, Showed numerous minute white tubercles on both surfaces.

On section the liver showed minute glistening tubercles (Reserved for microscopical examination.)

Glands in hilum of liver not apparently enlarged; showed no obvious tubercles.

Kidneys:

Left Kidney.—The surface showed about six whitish nodules, the largest being the size of a pin's head. On longitudinal section one minute grey spot was visible. On radial section through the largest superficial nodule, this was seen to extend about its own diameter into the cortex. Another on section could be shelled out. It was soft and not calcareous, and was removed for microscopic examination.

Right Kidney.—About twelve nodules, similar to those noticed on the left kidney, were seen on the surface. On longitudinal section no specks visible On radial section one nodule was seen to extend about its own diameter into the cortex, and was shelled out entire for microscopic examination.

Suprarenal Bodies.—Normal.

Diaphragm.—On the right pillar, seen from the pleural side, one opaque tubercle, the size of a pin's head, was seen. On the left pillar there was a similar nodule, visible from both sides. Each nodule lay on the pleural side of the pillar, and in the middle of a transparent ridge or fringe, apparently fibrinous. A third similar nodule was seen in the middle of the central tendon on the right side.

Bronchial Glands, Dorsal Mediastinal Glands.—Were greatly enlarged and showed in their substance numerous yellow nodules of tubercle.

Lower Tracheal Glands.—Also affected.

Lungs:

Left Lung:

Upper Lobe. Showed areas of collapse and acute emphysema and contained numerous large firm nodules. On section these nodules were seen to be very large and completely caseous, separated from each other by collapsed and apparently emphysematous lung tissue.

Lower Lobe.—Several large nodules; lower part emphysematous.

Right Lung:

Middle Lobe.—Enlarged and solid: gelatinous-looking; studded throughout with yellow tubercles. Recent lymph on surface.

Upper Lobe.—Some emphysema posteriorly; otherwise similar to middle.

Lower Lobe.—Showed tuberculous nodules in one flap and scattered tubercles in rest of lung, which was emphysematous.

Pleura.—To the right of the middle of the sternum the costal pleura carried six minute pearly-white hemispherical tubercles. Along some of the intercostal spaces there were fringes of fibrin.

Pericardium.—Normal. No excess of fluid.

Heart.—Muscle and valves normal.

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* The mother of this monkey died at the Quarantine Station a fortnight after arrival there; the post-mortem examination showed a large mammary abscess and no trace of tuberculosis in any of the organs or glands. The young monkey had been removed from its mother some days before her death and was reared artificially, being fed with a spoon for some days until it was able to feed itself. Its food consisted of milk, which was always sterilised, boiled bread and bananas.

Spleen.—Greatly enlarged, showed very numerous projecting nodules, 6 to 8 mm. in diameter.

Dura Mater, Pia Mater.—Normal.

Brain.—No tubercle at base. Substance normal on section.

Microscopical Examination.

In smears made from the emulsion (*see* below) a moderate number of bacilli was found.

Tubercle bacilli were also found in smears from the spleen, ileo-cæcal gland, diaphragm, left and right kidney. In the latter numerous other organisms were also present—cocci, singly, in pairs and in chains, and various kinds of bacilli.

In a smear from a liver tubercle no tubercle bacilli were seen.

Paraffin Sections :—

Sections from two mesenteric glands and the ileum (two regions) were examined, but no tubercle bacilli were found.

In the lumen of the gut numerous chains of cocci were observed.

Animals Inoculated.

An emulsion was made from part of the spleen, the whole of the right lung and the mediastinal glands.

The emulsion contained 42,400 tubercle bacilli per cc.

Of this emulsion :—

Calf 122 and Calf 132.—Each received 22 cc. subcutaneously.

Guinea Pig 545 and Guinea Pig 546.—1 cc. subcutaneously.

Guinea Pig 547 and Guinea Pig 548.—1 cc. intraperitoneally.

Guinea Pig 549 was inoculated with an emulsion made from the liver.

All the guinea pigs died of general tuberculosis.

RHESUS MONKEY 70.

Fed with Milk of Cow 74 from October 21st, 1903, to October 25th, 1903.

Duration of Feeding—5 days.

Amount of Tuberculous Milk Consumed=40 cubic centimetres.

Killed—November 14th, 1903. 24 days after the experiment began.

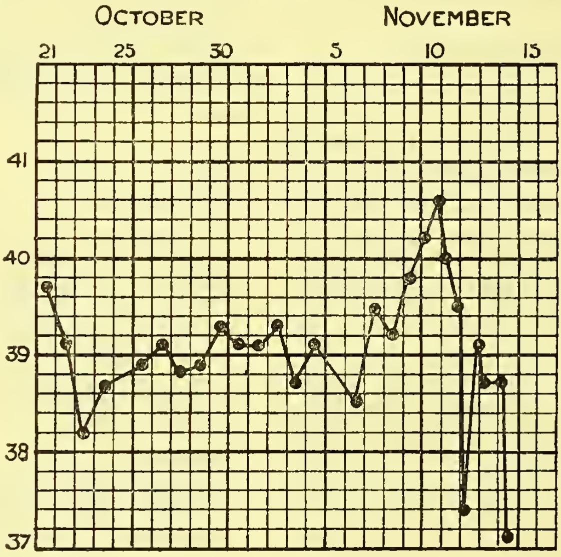
Clinical History.

This monkey was born on the voyage from India on or about the 10th of April, 1903, and was a week old when it arrived at the quarantine station. It was sent to Walpole on October 6, 1903, with another young monkey, No. 68, of about the same age. Both monkeys were tested with tuberculin at Walpole with a negative result. Monkey 68 acted as control to Monkey 70. On arrival at Walpole, Monkey 70 appeared to be healthy in every respect; he was lively and very active and continued so up to November 6, 1903. On this date he was noticed to be a little seedy; his coat "stared" and his appetite was not so good. The signs of ill-health continued and increased in severity; on November 9, he vomited after a meal. On November 12th he sat dejectedly in a corner, occasionally uttering plaintive cries; he gaped continually, each gape being accompanied by a short spasmodic inspiratory gasp (hiccough ?). The respirations were increased (66 per minute); the coat was very rough and the appetite poor.

On November 13 and 14 he was a little worse, and was visibly wasting; he was occasionally heard to cough; the temperature on the 14th fell to a very low level (37·1°C.).

The tuberculous milk used to feed the monkey was usually of a pale lemon yellow colour and on standing deposited a thick white sediment; it was extremely rich in tubercle bacilli.

Temperature.



POST-MORTEM EXAMINATION.

One submaxillary lymphatic gland showed two minute yellow points; another showed one minute point.

Inferior Cervical Glands.—On both sides normal.

Buccal Lymphatic Glands, Parotid, Larynx, Pharynx, Tonsils, Œsophagus, Posterior Pharyngeal Glands, Stomach, Intestines.—Normal.

Mesenteric Glands.—Considerably enlarged; at the upper part one gland showed numerous foci of tubercle; three others were also obviously affected.

Colic Glands.—One colic gland, near the cæcum, was obviously affected; a colic gland near the middle of the colon showed a yellow focus; another colic gland near the latter showed a similar focus.

Other colic glands normal.

Omentum, Pancreas.—Normal.

The glands around the stomach were normal.

Spleen.—Not enlarged. Normal in appearance.

Kidneys.—Normal throughout.

Suprarenal Bodies.—Normal.

Liver.—Normal throughout.

Lumbar, Iliac, Inguinal, and Axillary Glands.—Normal.

Diaphragm.—Normal.

Pericardium.—Normal; contained a small amount of fluid.

Heart Valves and Muscle Substance.—Normal.

Lungs.—Were emphysematous, especially at the edges, and felt nodular throughout; they showed also patches of collapse; on section they showed closely set miliary tubercles commencing to caseate.

Bronchial Glands, Mediastinal Glands.—Were enlarged and showed numerous foci of tubercle.

Trachea, Brain and Meninges.—Normal.

On the right side the first eight ribs showed cartilaginous nodes near the angles; the fourth and sixth had in addition a node in the course of their shafts. On the left side similar nodes were seen in the fourth to the seventh ribs, about the centres of the shafts. The latter on section were cartilaginous throughout; the former were bony in the centres. There was slight beading at the junctions of some of the costal cartilages and ribs.

Diagnosis.

Tuberculosis of mesenteric and colic glands, lungs and bronchial glands.

Microscopical Examination.

Smears from the Lung, a Mediastinal Gland, a Mesenteric Gland, and a Mid-Colic Gland showed numerous tubercle bacilli.

Paraffin Sections.

Paraffin sections of the two affected submaxillary glands were prepared. One gland showed an enlargement of one of the cortical nodules with early necrosis of the lymphoid cells; bacilli were very numerous and were scattered singly and in groups throughout the nodule; no giant cells were seen. The second gland showed a larger area of necrosis affecting at least three of the cortical nodules; in this area there were large patches of tissue unstained with methylene blue and small masses of lightly stained round cells. Tubercle bacilli were numerous in every part of the affected area, but were more abundant in those parts not completely necrosed: bacilli were also found in the midst of apparently unaltered cells at the periphery of the area.

Animals Inoculated.

With an emulsion made from pieces of affected lung, G.P. 695. (S.) died in 33 days of general tuberculosis; G.P. 696. (S.) died in 38 days of general tuberculosis; G.P. 698. (I.) died in 16 days of acute tuberculosis; G.P. 698. (I.) died in 14 days or acute tuberculosis.

With emulsion from spleen, G.P. 703. (I.) killed in 38 days, general tuberculosis.

Monkey 68, reared practically from birth in the quarantine station at Isleworth, kept under similar conditions and of the same age as Monkey 70, was used as a control. It was killed on November 3rd, 1903, and found to be perfectly healthy. Two guinea pigs inoculated from it remained healthy.

RHESUS MONKEY 72. (Aged Female.)

(Mother of Monkey 70.)

Fed on October 26th, 1903, with a small quantity of Milk from the inoculated quarters of cow 74.

Died—November 14th, 1903. 19 days later.

Clinical History.

She was tested with tuberculin at the quarantine station, with a negative result.

On arrival at Walpole on October 26th, she was given some bread moistened with a small quantity of tuberculous milk from Cow 74 (the milk was withdrawn from the left fore quarter after the death of the cow); the monkey ate some of the dry parts of the bread but picked out and threw away all those parts moistened with the milk. A few drops, however, remained in the measure; these were diluted with saline and pipetted into the mouth of the animal. A smear from the diluted milk showed fairly numerous tubercle bacilli.

The monkey at first enjoyed moderately good health and had a fair appetite; she was evidently very old; her back was bowed and stiff and many of her finger joints were stiffened. Nine or ten days after arrival at Walpole she broke loose from her chain, climbed to the rafters, and for some reason lost her grip, falling to the ground on to her head, a distance of 10 to 12 feet. After this fall she became very weak and would eat very little food.

On the morning of November 14 she was found in a moribund condition hanging over the side of the bench to which she was chained; during the night she had evidently slipped over the edge and remained suspended at the end of the chain, too weak to struggle back again. Throughout the day she was cold and collapsed and quite insensible to her surroundings; she died in the early part of the evening.

The temperature during the first nine days never exceeded 37·6° C.; after her fall it was constantly abnormally low, on several occasions barely raising the level of the mercury in a clinical thermometer; on the day of her death the temperature was too low to record.

POST-MORTEM EXAMINATION.

Body.—Greatly emaciated.

Submaxillary Glands, Cervical Glands, Inguinal Glands.—Normal.

Small Intestine.—The coats were thinned, but were otherwise not abnormal.

Cæcum.—Had two circular ulcers, one 1·5 cm. the other 0·5 cm. in diameter; also around the ileo-cæcal valve an irregular ulcerated area.

The ulcers had abrupt edges, smooth, slightly pigmented floors and thickened bases; there were no subperitoneal tubercles.

Colon.—About the middle a portion of the gut for a distance of two and a half inches showed an almost complete absence of mucous membrane and greatly thickened muscular and submucous coats; the lumen of the tube at this part was narrowed. Immediately below, for about an inch and a half, there was serpiginous ulceration, isolating small islands of mucous membrane. A little lower down one or two small irregular ulcers were seen.

Liver, Spleen, Kidneys, Suprarenals.—Normal on surface and on section.

Mesenteric Lymphatic Glands, Gastric, Colic, Lumbar, Iliac.—Normal in appearance.

Lungs.—Showed on the surface several small greyish areas; these on section were thin-walled cavities containing minute white parasites.

The bases of both lower lobes were adherent by fibrous bands to the diaphragm.

The lungs and thoracic glands exhibited no naked eye evidence of tubercle.

Heart, Brain and Meninges.—Normal.

Animals Inoculated Intraperitoneally.

Guinea-pig 704, inoculated with an emulsion made from the submaxillary glands and killed after 32 days, showed general tuberculosis.

Guinea-pig 705, inoculated with an emulsion made from several mesenteric glands, died in 22 days of general tuberculosis.

RHESUS MONKEY 64. (Aged Female.)

Fed with Milk of Cow 68 from June 29th, 1903, to August 1st, 1903, a period of 33 days.

Amount of Milk Consumed—about 1,290 cubic centimetres.

Killed—September 24th, 1903. 87 days after the experiment began.

Clinical History.

The monkey was a very old animal and was not in good condition on arrival at Walpole; she was thin; her back was stiff and considerable bowed, and from her nostrils there was a slight mucous discharge which later became muco-purulent.

She was tested with tuberculin at the quarantine station with a negative result.

The monkey did not drink the milk at all readily; on many occasions it had to be given mixed with her ordinary food; on several days no milk at all was taken; on others the food containing the milk would not be completely consumed; an exact estimate therefore of the total amount drunk was not possible.

The appetite of the animal from the start was not good, and during the time she was at Walpole became poorer. Besides the loss of appetite there was, day by day, slight but appreciable increase in weakness and emaciation.

The temperature was not taken.

Tuberculin test, September 15th, 1903, 74 days after the experiment began. Rise of temperature 0·8° C. Dose of tuberculin 0·5° C.

POST-MORTEM EXAMINATION.

Animal much emaciated.

No fluid in peritoneal cavity.

The omentum, great mesentery and colic mesentery contained numerous tubercles, varying in size from a barley grain downwards.

A few tubercles were also present under the peritoneum on the floor of the abdomen. The tubercles were opaque, greyish in colour; not visibly caseous.

In the pelvic cavity, above the uterus, lying quite free, were three bodies with smooth surfaces. The largest was oval in shape, and 3 cm. in its long diameter. It had an opaque white surface, for the most part fibroid in character, but in some parts bony. The two smaller ones were somewhat softer, nearly spherical, about 1 cm. in diameter.

On section through the large body there was, beneath a thin fibrous capsule, an incomplete bony shell, thicker and more opaque in some places than in others, surrounding a brown translucent jelly-like material; this was subdivided into rounded areas by thin calcareous trabeculæ.

The posterior ends of the inferior turbinate bones were thickened and congested.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Intestines.—There was no ulceration of the mucous membrane of the small intestine: in several places the coats of the intestine were considerably thinned, in some for a distance of four inches; the mucous membrane in these places was smooth, and when placed in formalin was not thrown into folds in the way that normal membrane usually is.

In the upper part of the caecum there was a longitudinal ulcer, 1 in. by ¼ in.; the thickened and raised margins were in contact and projected over the upper two-thirds of the ulcer, whilst at the lower end a triangular part of the floor was exposed. The surrounding mucous membrane was slightly puckered, but showed no congestion: the base of the ulcer was thickened and fibroid.

There was a little group of subperitoneal tubercles in the thickened peritoneum near one end of the ulcer, but similar tubercles were also seen in other parts of the caecum.

Near the longitudinal ulcer there was a slightly elevated circular area of thickened mucous membrane a quarter of an inch in diameter, with a small central ulceration: the base was thickened and some minute yellow points were seen under the peritoneum. Both ulcers appeared to be ulcers of old standing.

None of the abdominal glands appeared to be enlarged or otherwise abnormal, except the hepatic and one gastric gland. The latter was not enlarged, but showed on section two opaque points about the size of mustard seeds, which may have been tubercles. No tubercle bacilli were found in a smear made from this gland.

Liver.—Crowded with nodules, for the most part yellow and opaque, the largest about 3mm. in diameter.

Hepatic Lymphatic Glands.—Showed one or two small tubercles, similar to those noted in the gastric glands.

Spleen.—Partially adherent to diaphragm and left kidney, was a little enlarged and crammed with yellow opaque tubercles, the largest ½ cm. in diameter.

Kidneys.—The right contained one opaque tubercle in its cortex about 2 mm. in diameter.

In the substance of the left kidney, in the boundary layer, there was a somewhat smaller tubercle.

Suprarenal Bodies.—Normal.

In the *diaphragm*, both subpleural and subperitoneal, there were numerous yellow tubercles (most numerous on left side).

Pleura.—Normal.

Lungs.—Both lungs contained dozens of firm tubercles, and in addition the right lung contained a rounded nodule, 2½ cm. in diameter, which on section was found to be caseous almost throughout.

Right Bronchial Gland.—Was enlarged and contained some small tubercles.

The left appeared normal.

At the upper part of the thorax, behind each first rib, there was an enlarged gland; that on the left side contained three or four greyish white caseous areas, whilst that on the right side was entirely softened. Two large glands in front of the trachea were in a similar condition to the latter and contained soft greenish pus.

The glands in the posterior mediastinum were much enlarged and caseous throughout.

Brain and its Membranes.—Normal.

Lying close to the periosteum of the left parietal bone there was a flattened leaden pellet.

There was a malunited fracture of the left tibia and several dislocated joints in the tail.

Various Lymphatic Glands:

Cervical, Submaxillary, Femoral, Inguinal, Sublingual.—Normal.

Each *Lumbar Gland* had a caseating tubercle about the size of a No. 4 shot.

Microscopical Examination.

Smears from:

The Large Nodule in Right Lung.—Five tubercle bacilli.

A Tubercle in the Mesentery.—Three tubercle bacilli.

A Tubercle in the Liver.—Twenty tubercle bacilli.

A Tubercle in the Spleen.—No tubercle bacilli.

Emulsion of Spleen (*used to inoculate Guinea Pigs.*)—Tubercle bacili.

Caseous Thoracic Gland.—One tubercle bacillus.

A Kidney Tubercle
A Lumbar Gland } No tubercle bacilli.
A Gastric Gland

Guinea-Pigs Inoculated.

Four guinea-pigs were inoculated with an emulsion from the spleen, two subcutaneously and two intraperitoneally; all developed tuberculosis.

RHESUS MONKEY 66. (Adult Male.)

Fed with Milk of Cow 68 from June 29th, 1903, to August 1st, 1903, a period of 33 days.

Amount of Milk Consumed—3,055 cubic centimetres.

Killed—September 24th, 1903. 87 days after the experiment began.

Clinical History.

On arrival at Walpole this monkey was in very good condition and during the experiment showed no sign of ill-health.

Tuberculin Tests.

June 21st, 1903. Before experiment. Result, negative.
September 16th, 1903. 74 days after the experiment began. Dose of tuberculin 0·5°C. Result, negative.

POST-MORTEM EXAMINATION.

Condition.—Moderately good; very little fat. Muscles firm and well developed.

Left Tonsil.—Showed two yellow foci; one not larger than a mustard seed, the other just visible.

Pharynx, Oesophagus, Cervical, Submaxillary and Sublingual Glands.—Normal.

Omentum and Peritoneum.—There was no tubercle on the peritoneum; the omentum showed a small hard gland, from which on section soft dirty yellow matter exuded.

Other glands in omentum normal.

Stomach, Small Intestine.—Normal.

Large Intestine.—The caecum showed a small ulcer ¼ in. by ⅛ in., with an irregular hard base; no subperitoneal tubercles visible.

Just below hepatic flexure there were three large glands attached to the colon; on section surrounded by thick connective tissue enclosing cheesy matter and a few discrete tubercles. In the mucous membrane opposite the glands was a transverse irregular ulcer ¾ in. by ¼ in., with subperitoneal discrete tubercles in the base.

There was a small triangular ulcer in transverse colon: no obvious tubercle in base: lower down were one or two small erosions; no visible tubercle.

The rest of the colic glands (except those described above), normal.

One gland (gastric) at head of pancreas showed one yellow tubercle.

Lumbar, Iliac, Inguinal Glands, Larynx, Trachea—Normal.

Liver.—Showed on the surface sparsely scattered slightly projecting tubercles, 1 to 3 mm. in diameter, the larger showing yellow caseous centres.

Hepatic Lymphatic Gland.—Showed one small yellow tubercle.

Spleen.—Showed several projecting caseous tubercle like the liver.

Suprarenal Bodies, Kidneys, Testicles.—Normal.

Lungs.—Showed very sparsely scattered hard tubercles, 2 or 3 mm. in diameter, caseating in the centre; all on the surface, about ten in all.

Left Bronchial Gland.—Showed a small caseous tubercle. Other thoracic glands were normal.

Heart, Pericardium, Pleura, Dura Mater, Pia Mater, Brain.—Normal.

Diagnosis.

Primary tuberculosis of caecum and colon (two tuberculous ulcers).

Secondary tuberculosis of colic glands, of one gastric gland, one hepatic gland, of liver and spleen; of one bronchial gland and of both lungs (very slight).

Microscopical Examination.

Tubercle bacilli were found in smears made from the left bronchial gland, a large colic gland and the emulsion of the spleen used to inoculate guinea-pigs.

No tubercle bacilli were seen in smears made from a lung and a liver tubercle.

Paraffin Sections:—

> Sections through the yellow tubercle in the gastric gland showed a focus of necrosed tissue and degenerating cells: in every part of the area tubercle bacilli were found.
>
> Sections through one of the tubercles in the left tonsil showed an irregular area of large palely staining cells and a few giant cells. No tubercle bacilli were seen.
>
> Near the mouth of one of the crypts a tubercle bacillus was seen on the surface of the epithelium in the midst of some cocci.

Guinea-Pigs Inoculated.

With emulsion of spleen:—G. P. 591 (S.); G. P. 592 (S.); G. P. 593. (I.); G. P. 594 (I.).—All died of general tuberculosis.

RHESUS MONKEY 74.

Fed six times between November 21st and December 9th, 1903, with culture obtained from the supramammary lymphatic gland of Cow 68. (Virus B. III.)

Doses—November 21st, 1903, one serum culture, 3rd generation, 18 days old; November 25th, 1903, one serum culture, 5th generation, 12 days old; November 27th, 1903, one serum culture, 5th generation, 14 days old; November 29th, 1903, one serum culture, 5th generation, 16 days old; December 3rd, 1903, four serum cultures, 5th generation, 12 days old; December 9th, 1903, three serum cultures, 6th generation, 12 days old.

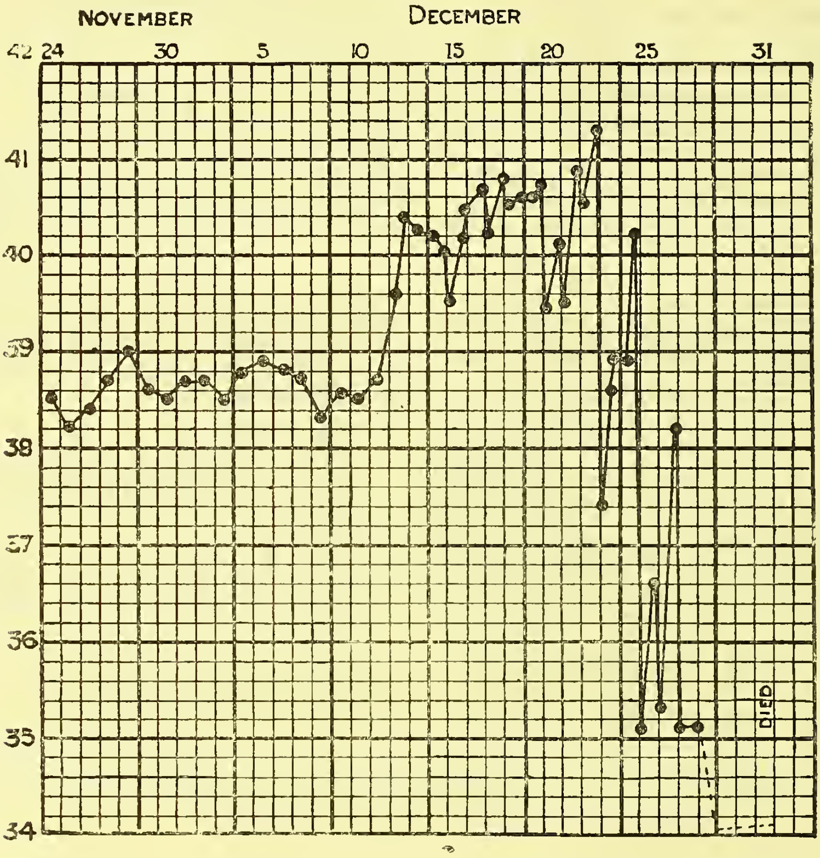
The growth on each of the serum tubes was thin and scanty.

Found Dead—December 31st, 1903. 40 days after the experiment began.

Clinical History.

The monkey became suddenly ill in the last week of December—rough coat, loss of appetite and quietness. The temperature then began to fall, and other signs of collapse quickly supervened; during the last four days of life the temperature was too low to be recorded on a clinical thermometer.

Temperature.



POST-MORTEM EXAMINATION.

Animal thin, but not markedly emaciated,

Tongue, Oesophagus, Larynx, Trachea.—Normal.

Tonsils.—Showed no sign of tuberculosis.

Posterior Pharyngeal Glands.—Were enlarged and showed softened caseous nodules, the largest about 4 mm. in diameter.

Submaxillary Glands.—Were also enlarged and contained similar, but smaller nodules.

One submental gland contained a caseous focus.

Cervical Glands.—Two cervical glands in the middle of the neck, one on each side, showed minute foci.

A deep cervical gland on the left side in the posterior triangle showed caseous nodules.

A gland on the opposite side was normal.

Abdomen:

Peritoneal Cavity.—Contained a small amount of clear yellow fluid.

Somatic Peritoneum.—Normal.

Mesenteric Glands.—At the junction of the ileum and the cæcum a large glandular mass was found, measuring 4 by 3 by 2 cm. The mass was entirely softened and yellowish white in colour.

Besides this mass numerous other glands, situated along the attachment of the mesentery to the small intestine, were found to be enlarged and to contain caseous foci.

There were numerous enlarged glands along the junction of the mesentery and the colon, all showing caseous foci.

Small Intestine.—The interior of the small intestine showed a few minute ulcers in the Peyer's patches.

The solitary glands were all indurated and on section were seen to be caseous in their central parts.

A smear made from one of these showed very numerous tubercle bacilli.

The Peyer's patches were firm and on section resembled the solitary glands. On the peritoneal surface opposite to them were caseous deposits in the form of small irregular masses and foci, extending in one case all round the circumference of the bowel. In the upper part of the bowel the peritoneum showed scattered caseous foci.

Large Intestine.—In the large intestine three nodules were found in the mucous membrane of the colon. These nodules were each about the size of a pea, and one contained caseous foci.

Liver.—Contained one yellow tubercle in the substance of the organ; otherwise normal.

Spleen.—Showed three yellow foci, two on the surface and one in the substance, about the size of pins' heads.

Kidneys.—One kidney showed in the cortex beneath the capsule a minute translucent tubercle. The other kidney was normal.

Suprarenals.—Both normal.

Thorax:

Lungs:

Right.—Upper lobe adherent to the thoracic wall; middle lobe partially adherent. The whole of the lung was congested and contained about six or eight nodules, varying in size from a small to a large pea, all caseous in the centre, and a few smaller ones that were not caseous.

Left.—The lower lobe was fixed by recent adhesions. The lung presented similar appearances to the right.

Bronchial Glands.—Both bronchial glands were enlarged and contained numerous caseous foci.

A gland immediately superior to the right bronchial gland was similarly affected.

A gland in front of the trachea, behind the manubrium sterni, was enlarged and contained a caseous focus.

Heart, Pericardium.—Normal.

Axillary Glands, Inguinal Glands, Iliac Glands, Lumbar Glands, Brain and Meninges.—Normal.

Microscopical Examination.

Smears from:

Mesenteric Gland, Spleen.—Tubercle bacilli.

Kidney.—A few tubercle bacilli.

Posterior Pharyngeal Gland.
Submaxillary Gland. } Tubercle bacilli found.

Solitary Gland (Intestine).—Numerous tubercle bacilli.

Nodule in Cæcum.
Subperitoneal Nodule. } Tubercle bacilli found.

Guinea-Pigs Inoculated.

With Emulsion of Mesenteric Glands.—G.P. 768 (S.); G.P. 769 (I.).

With Emulsion of Spleen.—G.P. 770 (S.); G.P. 771 (I.).

With Peritoneal Fluid.—G.P. 781 (S.).

All died of general tuberculosis.

RHESUS MONKEY 76.

Fed with Culture (20 days old, 4th generation) obtained from the supramammary lymphatic gland of Cow 44.

Dose—0·01 milligramme.

Date—April 7th, 1904.

Died—November 21st, 1904. 228 days after.

Clinical History.

During the first four months the monkey showed no signs of illness. Towards the end of August he appeared to be thinner, and his coat was rough. In September the respirations became slightly increased, and the animal was distinctly thinner; the amount of food eaten began to grow less.

During the month of October he got progressively thinner and weaker, and in the last few weeks of life emaciation and weakness became extreme; quiet respiration was only slightly increased, but after exertion was very hurried. There was occasional cough, never severe, in the latter part of the illness.

He was found in a moribund condition on November 21st, 1904, 228 days after being fed.

Temperature.—The temperature until October 6th was practically normal and never rose higher than 40·0°C., (except after a tuberculin test); during the rest of the experiment it showed a tendency to assume a slightly higher level.

Tuberculin Tests.

June 23, 1904. Dose of tuberculin, 0·5 cc. Reaction negative; temperature greatly depressed.

July 27, 1904. Dose of tuberculin, 1·0 cc. Reaction positive. Rise of temperature, 1·7° C.

September 1, 1904. Dose of tuberculin, 2·0 cc. Reaction positive. Rise of temperature, 1·2° C.

September 19, 1904. Dose of tuberculin, 8·0 cc. Reaction positive. Rise of temperature, 1·2° C.

October 4, 1904. Dose of tuberculin, 5·0 cc. Reaction positive. Rise of temperature, 1·6° C.

October 6, 1904. Dose of tuberculin, 5·0 cc. Reaction positive. Rise of temperature, 1·6° C.

October 20, 1904. Dose of tuberculin, 5·0 cc. Slight rise (to 40·9° C.), but temperature very high at time of test.

October 21, 1904.—Dose of tuberculin, 5·0 c.c.; rise of temperature, 0·6° C.

October 22, 1904.—Dose of tuberculin, 5·0 c.c.; rise of temperature, 0·8° C.

October 24, 1904.—Dose of tuberculin, 5·0 c.c.; rise of temperature, 0·9° C.

October 26, 1904.—Dose of tuberculin, 5·0 c.c.; rise of temperature, 0·8° C.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Tongue, Tonsils, Pharynx, Submental Glands, Submaxillary Glands.—Normal.

Left Pharyngeal Gland.—The size of a pea, was partly caseous.

Right Pharyngeal Gland.—Twice the size of the left was caseous and softened throughout.

Cervical Glands.—A cervical gland in the middle of the neck, on the right side, resembled the pharyngeal. Other cervical glands were normal.

In the subcutaneous tissues a little above and to the right of the right nipple, there were two thin-walled cysts, half an inch and two-thirds of an inch in diameter respectively, filled with thick greenish-yellow caseo-pus (probably glands); the cysts were joined together and the skin was freely movable over them. In the right axilla there were two glands, one the size of a French bean, the other smaller, which were practically caseous throughout. Between these glands and the cysts described above there was a small gland, which was normal on section.

The glands along the external mammary vein and in the axilla on the left side were normal.

Inguinal Glands.—One left inguinal gland, 1 cm. in diameter, was caseous throughout and softened.

Right inguinal glands normal.

Abdomen:

Omentum.—The omentum was thickly studded with yellow nodules ranging in size from a No. 4 shot to a split pea; on section they were caseous throughout and softened; they were most numerous near the spleen and around the lower border of the stomach. Besides the larger nodules there were fairly numerous glassy, almost transparent tubercles, the size of mustard seeds.

In the lower part of the omentum there was a large fibroid (parasitic) nodule, which was adherent to the ileum two inches from the ileo-colic valve; the nodule contained a cavity filled with dark greenish material.

Peritoneum.—The parietal peritoneum showed below the left kidney a group of caseous tubercles, the largest the size of a shot.

The mesentery showed one small tubercle and a pea-sized caseous nodule. On the meso-colon there were a few scattered nodules.

Spleen.—Was closely adherent to the abdominal wall and peritoneum covering the left kidney; it was much larger than normal, measuring 3 in. by 1½ in. by 1 in. The capsule, where adherent, was very thickened and showed in other parts numerous caseous tubercles, singly and in groups.

On section the pulp was extensively replaced by yellow caseous softened masses, some of which were very large and lobular in outline.

The lymphatic glands in the hilum of the spleen were enlarged and partly caseous.

Liver.—The substance was pale and closely beset with tubercles and nodules; the tubercles, mostly about the size of pins' heads, were yellowish-white in the centre, translucent at the margins; the nodules were thin-walled cysts, the size of peas, filled with glairy bile-stained muco-pus.

Portal Glands.—Three in number, the largest the size of a sparrow's egg, were caseous throughout and entirely softened.

Kidneys.—The left kidney showed in the cortex on the surface moderately numerous tubercles, ranging in size from a point just visible to the naked eye to a body 2 mm. in diameter; the small tubercles were grey, the larger ones opaque and caseous; in the depth of the cortex similar tubercles were seen, but here they were not so numerous as on the surface.

The right kidney showed similar tubercles.

Suprarenal Bodies.—Normal.

Pancreas.—On section through the head of the pancreas numerous small cavities, filled with caseopus, were seen.

Cœliac Glands.—Three or four cœliac glands were enlarged and showed in the cortices soft caseous areas and foci.

Lumbar Glands.—The glands in the lumbar region were fused together to form a mass the size of a thrush's egg. On section they were completely caseous and softened and had thick fibrous capsules.

Iliac Glands.—Were enlarged and contained caseous foci.

Stomach.—Normal.

Small Intestine.—The mucous membrane of the small intestine showed from twelve to fifteen small ulcers, with raised congested undermined margins and slightly thickened caseous bases. The ulcers occurred chiefly in the lower part of the intestine.

Large Intestine.—The walls of the large intestine contained numerous pea-sized parasitic nodules, filled with dark grumous material.

Mesenteric Glands. — Three mesenteric glands were moderately enlarged, and showed on section caseous softened areas, which practically entirely replaced the gland substance. The rest of the mesenteric glands (in the lower part of the mesentery) were little if at all enlarged and showed small isolated caseous nodules.

Ileo-Colic Glands.—Slightly enlarged, showed similar nodules.

Colic Glands.—Many of the colic glands were enlarged to the size of peas and were caseous throughout; others contained caseous nodules, 2 and 3 mm. in diameter.

Thorax:

Heart.—On the pleural surface of the pericardium there were several caseous tubercles, ranging in size from a pin's head to a pea.

On the pericardium covering the great vessels there were a few discrete tubercles.

Heart muscle and valves normal.

Lungs.—Both caudal lobes were attached to the lower part of the chest wall by long slender processes of connective tissue.

The right cephalic lobe showed a firm adhesion to the posterior wall of the thorax.

Right caudal lobe contained fairly numerous grey miliary tubercles, opaque and caseous in the centre. Similar tubercles were seen on section, and one or two that were slightly larger.

The right middle lobe was almost completely consolidated, the solid parts consisting of reddish translucent tissue, closely studded with caseous tubercles; at the tip of the lobe there was a large caseous and softened nodule.

The right cephalic lobe showed near the root a large solid mass in an advanced condition of caseation; the pleura over it was thickened and adherent to the chest wall; the rest of the lobe was emphysematous, and showed miliary tubercles and one or two pea-sized nodules.

The left cephalic lobe contained a number of miliary tubercles, and one or two small nodules; one flap of this lobe was consolidated and extensively caseated.

The left caudal lobe contained in the depth surrounding the bronchus an irregular solid mass; the cut surface showed soft caseous areas and miliary tubercles surrounded by firm fibroid tissue; in the upper part of the mass there was an irregular air containing cavity with smooth walls lined with caseopus. In the upper part of the lobe there was a second consolidated mass, very irregular in outline, showing on section miliary tubercles and areas of early caseation.

Bronchial Glands.—The right praetracheo-bronchial and the intertracheo-bronchial glands were considerably enlarged (one of the latter was the size of a pigeon's egg); they formed an almost complete ring around the root of the lung; they had thickened capsules, and caseous very softened contents.

The left bronchial glands resembled the right, but were not so enlarged.

Just within the superior opening of the thorax, lying in front and to the side of the trachea, there was a group of four glands, two on each side; two were the size of thrushes' eggs, and two about 1 cm. in diameter; on section they were caseous throughout.

Pleura.—On the left side of the tenth dorsal vertebra there was a prominent caseous and softened mass, 1·5 cm. in diameter; on the right side a little superior to the latter there were two similar masses 1 cm. in diameter. In the intercostal spaces there were about half a dozen small sub-pleural caseous nodules.

On the pleura covering the costal cartilages there were several caseous tubercles.

Diaphragm.—At the junction of the muscle with the tendon there was a ring of caseous nodules, the largest the size of a broad bean; they caused projections on both surfaces. On the peritoneal surface there were also several shot-sized tubercles.

Testicles.—Normal.

Microscopical Examination. (*Smear preparations.*)

Small Intestine (two ulcers).—Tubercle bacilli very numerous in both.

Mesenteric Gland *Spleen* *Lung*	Very numerous tubercle bacilli.
Kidney *Ventral Mediastinal Gland* *Nodule beneath Skin*	Numerous tubercle bacilli.

Guinea Pigs Inoculated Subcutaneously.

No. 1357 with emulsion from spleen, died in 51 days of general tuberculosis.

No. 1358 with emulsion from ventral mediastinal gland, died in 55 days of general tuberculosis.

RHESUS MONKEY 78.

Fed with Culture obtained from the supramammary lymphatic gland of Cow 44 (Virus B. I. Table I. A.)

Dose—0·01 milligramme.

Date—April 7th, 1904.

Killed—June 17th, 1904. 71 days later.

Clinical History.

There was slight loss of flesh in the last few weeks, but no obvious symptoms of illness.

Temperature.—The temperature began to rise during the seventh week and for the remaining three weeks of life was maintained at a moderately high level, being generally above 40°C., or 104°F. (maximum 40·9°C. or

105·6°F.) and rarely falling below 39·7°C. The mean temperature during the first six weeks was 39·6°C.

POST-MORTEM EXAMINATION.

Condition.—Very little subcutaneous fat.

Tongue, Pharynx, Tonsils, Submaxillary Lymphatic Glands, Retropharyngeal Lymphatic Glands, Cervical (Superficial and Deep).—Normal.

Abdomen :

Omentum.—Contained fairly numerous nodules, ranging in size from a mustard seed to a good-sized shot; the larger ones were caseous and softened in the centre, but the smaller one were pale and translucent throughout. The mesentery and mesocolon showed scattered nodules similar to those in the omentum.

Peritoneum.—On the peritoneum covering the muscular portion of the diaphragm there were numerous grey granulations; on the tendinous portion there were a few small flattened caseating nodules; similar nodules were seen on the suspensory ligament of the liver.

The parietal peritoneum near the spleen showed two or three minute translucent granules.

Stomach, Gastric Glands.—Normal.

**Intestines.*—Nine inches from the pylorus the mucous membrane of the small intestine showed an irregular ulcer 7 by 10 mm. with raised rounded thickened margins and thickened caseous base; the ulcer was situated near the mesenteric attachment and its long axis lay longitudinally. Thirty-three inches above the ileo-caecal valve there was a circular ulcer 2 cm. in diameter; the margins were raised thickened and caseous; the floor and margins were covered with shreddy mucinous tissue; the base was thinned and showed softened caseous foci; the serous surface corresponding to the central part of the ulcer was deeply congested.

The serous surface of each ulcer showed an eruption of caseating tubercles, slightly raised above the surface and closely aggregated together.

The rest of the small intestine was normal.

Large Intestine.—Normal.

Mesenteric Glands.—Three of the mesenteric glands were greatly enlarged, ranging in size from a thrush's to a pigeon's egg; they were soft and fluctuant and on section were cysts filled with soft greenish yellow pus; beneath the peritoneum covering the glands numerous projecting tubercles, in size from a mustard seed to a large shot, were seen.

In addition to the above there were several smaller glands, the largest the size of a French bean, which on section were beset with pin-head sized caseous and softened foci.

Very few mesenteric glands were normal.

Ileo-Colic Glands.—Normal.

Meso-Colic Glands.—All the numerous small glands in the meso-colon were normal in size and appearance.

The Spleen was considerably enlarged and adherent over more than half its convex surface to the parietal peritoneum.

The capsule of the spleen, where free from adhesions, showed numerous flattened caseating tubercles from 1 to 2·5 mm. in diameter.

The substance of the spleen was crammed with spherical nodules, many of which formed marked projections on the surface; they ranged in size from 2 to 10 mm. in diameter and were yellow externally. On section they were thin-walled cysts filled with soft caseo-pus, which in the larger nodules had a greenish tinge.

Liver.—On the capsule of the liver there were some scattered translucent foci which did not penetrate into the liver substance; beneath the capsule, and causing slight projections on the surface, were a few caseating nodules, the largest 3 mm. in diameter. Evenly distributed throughout the substance were numerous little whitish pin-point tubercles. The substance of the liver also contained a number of cysts from 2 to 3 mm. across, with greyish white walls and greenish yellow mucoid contents (biliary).

The gland near the hilum of the liver, in the small omentum, was normal.

Kidneys :

Left.—Showed in the cortex beneath the capsule two minute translucent tubercles about 1 mm. in diameter.

Right.—In the right kidney there were four similar tubercles near the surface, and two or three larger caseating ones in the deeper part of the cortex.

Suprarenal Bodies.—Normal.

Coeliac Glands.—One coeliac gland contained two pin-head sized caseating tubercles.

A gland lying on the pancreas showed a minute translucent tubercle, opaque in the centre.

Lumbar Glands.—Five in number, were slightly enlarged and showed on section softened caseous nodules.

Iliac Glands.—In the right iliac gland there was a translucent tubercle.

The left iliac was normal.

The Right Axillary Gland contained a pin-head sized softened caseous tubercle.

Inguinal and Left Axillary Glands.—Normal.

Thorax :

Heart.—Muscle and valves normal.

Lungs.—Were crowded with firm spherical nodules, varying in size from 1 up to 4 mm. in diameter; they were pretty evenly distributed throughout the substance, those beneath the pleura forming conspicuous projections on the surface. On section the nodules were firm yellow and caseous in the centre, translucent at the periphery, the larger ones being more advanced in caseation than the smaller. In the right cephalic lobe there was a nodule, 2 by 1·5 by 1·5 cm., which on section showed large caseous irregularly softened patches surrounded by firm greyish translucent tissue.

Bronchial Glands.—A bronchial gland situated on the anterior surface of the bronchus on the right side contained two or three small cavities filled with caseo pus.

All other bronchial glands (including the inter-tracheo-bronchial) were normal.

Ventral Mediastinal Glands.—Were normal.

Parietal Pleura.—Showed one or two slenderly attached fibrinous tufts, but no tubercles.

The pleural surface of the diaphragm presented a few minute pearly granules.

Microscopical Examination.

Smears from :—

Pus from Mesenteric Gland.—Showed no tubercle bacilli.

Right Axillary Gland.—No tubercle bacilli.

Lumbar Gland.—Numerous tubercle bacilli.

Pancreatic Gland.—A few tubercle bacilli.

Guinea-Pigs Inoculated Intraperitoneally.

No. 1065. With emulsion of liver, died in 25 days of general tuberculosis.

No. 1066. With emulsion of spleen died in 24 days of general tuberculosis.

No. 1067. With emulsion of pus from large mesenteric gland died in 20 days of general tuberculosis.

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* See Plate 3.

RHESUS MONKEY 80. (Adult Male.)

Fed with Culture obtained from the suprammary lymphatic gland of Cow 44, (Virus B. I. Table I. A.)

Dose—0·0001 milligramme.

Date—April 7th, 1904.

Killed—When dying, September 19th, 1904. 165 days later.

Clinical History.

The animal showed no sign of illness until towards the end of July (that is just before the temperature began to rise), when he began to lose flesh, and became breathless on the slightest exertion. The loss of flesh continued and he quickly became considerably emaciated; ordinary quiet respiration was much increased and slight exertion caused severe respiratory distress; there were also frequent paroxysms of coughing; during the last two weeks weakness became extreme, and very little food was eaten.

Temperature.

The temperature during the first seventeen weeks was fairly normal; then for five weeks it was raised, varying between 39·5° C. and 40·8° C.; during the last two weeks of life it began to assume a lower level, and on one occasion fell as low as 37° C.

Tuberculin Tests.

June 23rd, 1904: Dose of tuberculin: 0·5 cc. Result negative.

July 27th, 1904: Dose of tuberculin: 1·0 cc. Result positive. Rise: 1·3° C. Slight local œdema; no constitutional disturbance.

POST-MORTEM EXAMINATION.

Body.—Extremely emaciated.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen:

Omentum, Peritoneum, Stomach, Small Intestine, Large Intestine.—Normal.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal in size and appearance.

Spleen.—Not enlarged, normal on the surface, showed on section about a dozen nodules; four of these were large, varying from 3 to 4 mm. in diameter; the rest were small and not more than 1·5 mm. in diameter; all were yellow and caseous, the larger ones being softened.

The Liver showed immediately beneath the capsule about a dozen whitish tubercles, ranging in size from a mere speck up to 1 mm. in diameter; on section minute tubercles were seen sparsely scattered throughout the substance.

A gland in the small omentum (portal ?), and several in the hilum of the spleen, were normal.

Cœliac Glands, Lumbar Glands, Iliac Glands.—Normal.

Kidneys.—The right contained in the cortex one yellow caseous tubercle 1·5 mm., and a greyish-white tubercle about 1 mm. in diameter, both just beneath the capsule.

The left showed in the cortex three grey tubercles opaque in the centre, the largest about 1 mm. in diameter.

Suprarenal Bodies.—Normal.

Thorax:

**Lungs.*—The right lower lobe was everywhere closely adherent to the ribs and diaphragm and was separated from them only with difficulty. The left lower lobe was connected to the chest wall by numerous slender strands of connective tissue; the upper lobes were free from adhesions.

The right lung was greatly enlarged and very heavy; the lower and middle lobes were fused together and both were completely solid, except for a part at the apex of the lower lobe, which was baggy and fluctuant. The pleural surface was covered with a layer of partly organised lymph.

Beneath the pleura the lung substance had the appearance of being closely beset with pin-head sized yellow tubercles.

On section the cut surfaces of the middle and the greater part of the lower lobes showed very numerous patches and foci of caseation, surrounded by a reddish somewhat translucent consolidated tissue; the caseous patches varied in size, were irregular in outline, and showed in many places a tendency to unite together; the caseated tissue in the majority of the larger patches was much softened, and when placed under running water was easily washed away.

At the apex of the lower lobe there was a cavity one and a half inches in diameter, filled (but not distended) with soft yellowish-white caseo-pus and débris of lung tissue; part of the wall of this cavity was formed by thickened pleura, the rest by consolidated lung; the wall was lined internally with caseous tissue and was very ragged, showing partly detached masses and shreds of lung tissue; the cavity was crossed by soft fibrous tissue trabeculæ.

This cavity communicated with the main bronchus by a small opening.

In the anterior part of the base of this lobe there was a smaller cavity half an inch in diameter, also filled with soft caseo-pus.

The right upper lobe was adherent along its margins to the middle lobe, and was partly consolidated, but not so far advanced in caseation as the lower.

The left upper lobe contained numerous caseous and softened nodules, the largest the size of a pea; all had fibrous capsules. An accessory upper lobe was completely consolidated; externally it had a reddish colour, and numerous yellow foci were seen under the capsule. On section it was extensively caseated and resembled the right lower lobe.

The upper part of the left lower lobe was also consolidated and in a state of caseation; the lower part was normal, except for one or two isolated tubercles.

Bronchial Glands.—On the right side there were three glands; two were the size of filberts and were caseous throughout and softened; the third contained three or four caseous nodules.

On the left side there were four slightly enlarged glands, all of which contained scattered caseous foci.

Several intertracheo-bronchial glands also showed small foci.

Trachea, Larynx.—Normal.

The bronchi contained blood-stained mucus.

Pleura.—The parietal pleura on the right side was thickened and roughened, but no tubercle nodules were seen. Left pleura and diaphragm normal.

Heart.—Was displaced to the left; serous surface, muscle and valves normal.

Brain.—Normal.

Microscopical Examination (Smear Preparations).

Smears from:

Kidney.—Twenty tubercle bacilli seen.

Spleen.—Twenty-one tubercle bacilli.

Liver.—Tubercle bacilli moderately numerous.

Bronchial Gland.—Seven tubercle bacilli.

Guinea-Pigs Inoculated.

Two guinea pigs inoculated with an emulsion from a right bronchial gland, one subcutaneously, the other intraperitoneally, died of general tuberculosis in 44 and 28 days respectively.

A guinea pig inoculated intraperitoneally with an emulsion from the spleen died in 30 days of general tuberculosis.

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* *See* Plate 3.

RHESUS MONKEY 82.

Fed with Culture obtained from the supramammary lymphatic gland of Cow 44. (Virus B. I. Table 1 A.)

Dose—0·00001 milligramme.

Date—April 7th, 1904.

Killed—September 28th, 1904. 176 days after feeding.

Clinical History.

The general appearance of this animal at the beginning of the experiment was not specially good; she was thin and her coat was rough; her appetite was, however, good and she was fairly active. During the first four months she showed little alteration in health. In August she began to get thinner and weaker. During the last few weeks of life she showed marked œdema of the eyelids; her appetite was poorer and she became much weaker, although always able to climb about the cage; the respirations were never noticeably increased.

Temperature.

The temperature for the first thirteen weeks was fairly normal, varying usually between 39 ° and 39·7 ° C Then for three weeks it was very irregular, rising on several occasions to over 40 ° C., and only occasionally falling below 39 ° C.; during the last eight weeks the temperature continued to be irregular, often falling as low as 38 ° C., but never rising above 39·7 ° C.

Tuberculin Tests.

June 23, 1904. Dose of tuberculin, 0·5 c.c. Negative. Rise of temperature, 0·3 ° C.

July 26, 1904. Dose of tuberculin, 1·0 c.c. Negative. No rise of temperature (temperature high before the test).

POST-MORTEM EXAMINATION.

Body.—Emaciated, no subcutaneous fat.

Tongue, Tonsils, Pharynx, Submaxillary Lymphatic Glands, Cervical Lymphatic Glands.—Normal.

Right Retropharyngeal Gland.—Enlarged, caseous throughout and softened.

Left Retropharyngeal Gland.—Normal.

In the body of the left sterno-mastoid muscle there was a small firm caseous nodule; a similar one was seen in the belly of the left temporal muscle.

In the subcutaneous tissues of the abdominal wall, to the right of the umbilicus, there was a firm caseous nodule the size of a split pea.

In the muscle substance of the right latissimus dorsi there was a similar nodule, but this was softened in the centre.

Abdomen:

Omentum.—The omentum contained a moderate number of spherical tubercles, ranging from 0·5 to 1·5 mm. in diameter: the small tubercles were almost transparent, the larger ones opaque caseous and softened in the centre.

Parietal Peritoneum.—Normal.

The mesentery showed two or three firm pea-sized caseous nodules.

On the peritoneum covering, and in the neighbourhood of, the left kidney there was a close eruption of prominent caseous tubercles 2 to 3 mm. in diameter.

Stomach.—Normal.

Intestines.—In the mucous membrane of the duodenum there were two small ulcers with thickened congested margins; the bases were not thickened and there was no sign of caseation.

Several similar ulcers were seen in the mucous membrane of the lower end of the large intestine.

Mesenteric Glands, Ileo-Colic Glands, Colic Glands.—Normal.

The Spleen was slightly enlarged and showed on the surface numerous flattened grey translucent tubercles and a few small caseous nodules. On section the pulp contained a number of yellowish nodules and nodular masses, ranging in size from 1 up to 5 and 10 mm. in diameter; the masses were formed apparently by the aggregation of several small nodules; the nodules were caseous, but not softened.

In the hilum of the spleen there was a group of small glands, all of which were practically caseous throughout.

Liver.—Scattered throughout the substance there were numerous spherical yellow tubercles about 0·5. mm. in diameter; there were also just under the capsule six to eight larger nodules about 2·5 mm. in diameter, with caseous centres and grey translucent margins.

A gland in the small omentum (portal) contained an abscess cavity, 5 mm. in diameter, filled with caseo-pus.

A coeliac gland showed a caseous nodule, the size of a pin's head.

Kidneys.—The right kidney contained about a dozen nodules, the smallest 2 mm. in diameter, the largest 1·5 by 1 cm.; these nodules were situated chiefly in the cortical zone and some projected several millimetres beyond the surface; the largest nodule was wedge-shaped and extended into the medullary zone; all the nodules were firm and opaque yellow throughout.

The left kidney contained about the same number of nodules, but these were generally smaller in size, the largest being less than a centimetre in diameter.

Suprarenal Bodies, Lumbar Glands, Iliac Glands.—Normal.

Thorax:

Lungs.—The right apex was closely adherent to the chest wall and was separated from it only with difficulty; the right base was attached by slender fibrous strands.

The right apical and middle lobes had fused together and were converted into a thin-walled baggy abscess cavity; pressure on these lobes caused purulent material to issue from the trachea.

On section the cavity was found to contain yellowish white curdy pus; the internal walls were pinkish and granular and the cavity was crossed here and there by trabeculæ.

The lower lobe was adherent to the upper and middle lobes and contained numerous nodules and nodulated masses; the isolated nodules were usually about the size of a small pea and were firm and caseous throughout; the masses were formed by the fusion of similar nodules and were surrounded by reddish collapsed lung tissue. Very little normal lung tissue remained in this lobe.

An accessory middle lobe was greatly enlarged, solid, and on section practically entirely caseated; the pleura surrounding it was thickened.

Both lobes on the left side were closely beset with hard yellowish white nodules, ranging in size from a small shot to a pea.

In the upper lobe there was in addition a nodular mass, 2 cm. in greatest diameter, similar to those in the right lower lobe.

The left lower lobe contained as well as small nodules a large irregular caseated mass in the upper part and a cavity about 2 c.m. in diameter, filled with caseo-pus; the pleura over the caseous mass and over the cavity was greatly thickened.

Bronchial Glands.—The left bronchial gland was the size of a thrush's egg, and was yellow caseous and softened throughout.

The right bronchial gland appeared to be normal.

An intertracheo-bronchial gland showed a softened focus.

Pleura.—The diaphragm on the right side showed, projecting prominently beneath the pleura, three firm yellow caseous nodules the size of peas.

The parietal pleura on the right side showed scattered caseating tubercles.

On the left side beneath the pleura, in an intercostal space, there was a flattened softened caseous mass 1 by 0·5 cm.

Heart.—On the parietal pericardium there were numerous hard pearly tubercles, slightly opaque in the centre, the size of pins' heads; on the visceral pericardium there were a few similar tubercles, and one or two the size of a pea; one of the latter was adherent to the parietal pericardium and had fibrous walls and purulent contents.

At the base of the heart there was a group of nodules closely aggregated together.

In the interior of the left ventricle, near the apex, there was a small loosely attached opaque yellowish white nodule.

Heart muscle and valves normal.

Uterus, Ovaries, Inguinal Glands, Axillary Glands.—Normal.

Microscopical Examination.

Smears from:

Caseous Nodule in Abdominal Wall.—Nine tubercle bacilli.

Caseous Nodule in Latissimus Dorsi.—Seventeen tubercle bacilli.

Retro - Pharyngeal Gland.—Numerous tubercle bacilli; majority beaded, some very long.

Liver.—Nine tubercle bacilli.

Left Bronchial Gland.—Numerous tubercle bacilli; some very long and beaded.

Kidney.—Three tubercle bacilli.

Spleen.—No tubercle bacilli found.

A guinea-pig, No. 1280, was inoculated subcutaneously with an emulsion made from the left bronchial gland; it died in 69 days of general tuberculosis.

RHESUS MONKEY 104.

Fed with Culture derived from the original material of Virus B. IV.

Dose—1·0 milligramme.

Date—December 14th, 1904.

Died—December 27th, 1904. 13 days later, from some unascertained cause.

POST-MORTEM EXAMINATION.

Mouth, Buccal Pouches, Palate, Tonsils, Larynx, Submaxillary Lymphatic Glands, Small Intestine.—Normal.

Large Intestine.—Attached to the outer surface were some dark cysts, the largest about the size of a pea; they were most numerous about the cœcum, and had thin walls and brownish pultaceous contents; they occurred also in the mesocolon; they had the appearance of being suppurating lymphatic glands.

Mesenteric Glands.—Normal in size and appearance.

Liver.—Normal, except for a group of cysts, each about one-sixth of an inch in diameter, with contents very much like those of the cysts attached to the large intestine.

Spleen, Kidneys.—Normal.

Lungs.—Were rather dark reddish in colour, and slightly speckled with pigmented spots; sparsely scattered over the surface and loosely attached to the pleura were little translucent spherical bodies; these under a low power of the microscope resembled parasitic ova; in each a coiled up body could be seen.

There were, moreover, some small emphysematous bullae, in one of which a *Pneumonyssus* was found.

BABOON 28. (Young Female.)

Fed with Milk of Cow 172 from September 9th, 1904, until October 4th, 1904.

Duration of Feeding—25 days.

Amount of Milk—2,000 cc.

Died—November 25th, 1904. 80 days after the experiment began.

Clinical History.

Was first noticed to be seedy four weeks after the experiment began; she was less playful and seemed thinner. The appetite, however, remained good, and there was very little further change in the condition until November 23rd. On the latter day, after her evening meal, she was found lying on her side in a rigid condition, breathing rapidly and violently twitching her extremities; she was perfectly conscious throughout and recognised the people she knew in her usual way; she was quite unable to stand, having apparently lost all voluntary control over her muscles; she remained in this state for some little time, but in the morning appeared quite well again. The fits recurred on the two following nights, and presented identical features.

On the 27th she became collapsed, and on the 28th was found dead.

It was at first thought that the peculiar fits might be referred to the condition of the mesenterie glands; these undoubtedly imposed a barrier (evidenced by the great distension of the lacteal vessels after death) to the passage of nutrient fluids from the intestines to the general circulation. After a meal the obstructive effect of the mass at the root of the mesentery would be most felt, and it is conceivable that the resulting great distension of the mesenteric vessels might act reflexly on the central nervous system. But if this were so, it is difficult to see why the same phenomena were absent after the morning meals, and in the other baboons, whose mesenteric glands were more greatly enlarged.

There is another possibility, that the pneumonia which supervened was an acute process, and that the fits were a species of rigor. I do not think this is the explanation, because there was no rise of temperature; it is more probable that the consolidation of the lungs was the result of hypostasis, seeing that the animal during the fits, and during the period of collapse, lay on the side most affected.

Temperature.

The temperature was first taken twenty-five days after the experiment began.

From the twenty-sixth to the fifty-fourth day the temperature for the most part varied between 37·9° and 38·7° C., but occasionally rose in the evenings slightly above 39°. From the fifty-fourth to the seventieth day the temperature was generally higher; the highest point reached, however, was 39·7°. During the last week of life the temperature gradually fell, and for three days before death could not be registered on an ordinary clinical thermometer.

Tuberculin Tests before Experiment.—July 6, 1904. Negative. Dose of tuberculin, 0·5 cc.

August 1, 1904. Negative. Dose of tuberculin, 1·0 cc.

POST-MORTEM EXAMINATION.

Body.—Thin, but not emaciated.

Tongue, Pharyngeal Mucous Membrane.—Normal.

Tonsils.—Both tonsils were perhaps slightly enlarged, but not ulcerated; on section each contained a focus of soft whitish material. (No tubercle bacilli found.)

Pharyngeal Glands.—On the left side there were two glands fused together, forming a mass the size of a starling's egg: on section each gland had a thickened capsule and consisted practically throughout of soft pulpy caseated tissue.

On the right side there was a similar mass.

Submaxillary Glands.—Normal.

Cervical Glands.—On the left side, just below the pharyngeal glands, there was a small gland which showed in the cortex two caseous foci.

In a corresponding position on the right side, just below the pharyngeal glands, there were two small glands that were caseous throughout.

A slightly enlarged gland in the middle of the neck on the right side was beset with caseous foci.

The gland on the opposite side showed a few caseous foci.

Lower cervical glands, normal.

Abdomen :

Omentum.—The omentum was profusely covered with glistening semi-transparent tubercles, the largest the size of a pin's head.

Peritoneum.—On the peritoneum covering the diaphragm there were a few small tubercles: the rest of the parietal peritoneum was normal.

Stomach.—The mucous membrane of the stomach showed several minute hæmorrhagic erosions.

Intestines.—The serous surface of the last seven inches of the upper third of the small intestine was studded with opaque white tubercles, and showed also several thickened lymphatic vessels. In the subserous tissue of this length of bowel a network of dilated lymphatic capillaries could be seen, and many of the afferent lymphatic vessels leading from it were thickened opaque white and in some cases yellow in the centre; in other regions of the mesentery the lymphatic vessels were distended with pale lymph, but not thickened.

The mucous membrane of the first three feet of small intestine showed six small ulcers, with slightly raised congested margins and very slightly thickened base. In that length of bowel, the serous surface of which showed the eruption of tubercles, there were five ulcers: one was about 1 cm. in diameter, the rest were small; the large one had very irregular raised margins and slightly thickened base, showing caseous foci; two of the ulcers showed subperitoneal tubercles.

In the remainder of the small intestine there were about a dozen ulcers; they were all small and resembled those seen in the upper part; they were felt between the finger and thumb as slight thickenings, and one or two showed minute whitish points at the base; none of these ulcers showed subperitoneal tubercles.

Large intestine. In the upper part of the colon there were two small ulcers with yellow floors.

A spherical gland, 1 cm. in diameter, lying in close contact with the duodenum and near the head of the pancreas, was caseous throughout and softened.

Mesenteric Glands.—Were considerably enlarged; they were fused together to form a triangular mass two and a quarter inches long, one and a quarter inches wide, and about two-thirds of an inch thick; the peritoneum covering the mass had a pearly-white appearance and through it at various places yellow patches could be seen. On section the glands had thick fibrous capsules, and were, with one or two exceptions, caseous throughout, resembling the pharyngeal.

Ileo-Colic Glands.—Four on each side, were enlarged and fused together. On section they resembled the mesenteric glands; one small gland of the group on each side contained a caseous nodule and was distended with blood-stained œdema fluid.

Colic Glands.—Almost all the colic glands along the upper three-fourths of the colon were enlarged and caseous. They ranged in size from a small pea to a sparrow's egg. Along the first part of the colon they formed a continuous chain two and a half inches long and were closely adherent to each other and to the wall of the intestine. The lymphatic vessels leading to the glands were distended.

Spleen.—Not obviously enlarged, contained a moderate number of nodules ranging in size from a pin's head to a large pea. On section the larger nodules were yellow caseous and entirely softened; the smaller ones had caseous centres and translucent margins; some of the nodules projected on the surface; others were dimly seen through the capsule.

One lymphatic gland in the hilum of the spleen showed a caseous focus.

Liver.—The liver showed on the surface a moderate number of tubercles (about three dozen counted), ranging in size from a point just visible to the naked eye to a No. 4 shot; the larger tubercles were pearly-white externally, yellowish-white in the centre; the smaller ones were greyish white. On section similar tubercles were seen in the depth of the liver.

The gland in the small omentum was enlarged and beset with soft caseous areas from 2 to 5 mm. in diameter.

Kidneys, Suprarenal Bodies.—Normal.

Lumbar Glands.—One lumbar gland was slightly enlarged and partly caseous.

Iliac Glands.—Normal.

Thorax :

Heart, Pericardium, Pleura.—Normal.

Lungs.—The right lobes were heavy dark red and exuded on section blood-stained fluid which was only slightly frothy; pieces placed in water just managed to float; the posterior parts of the left lobes were in a similar condition. Sparsely scattered throughout the substance of both lungs were grey miliary tubercles, most of which were slightly opaque in the centre. They were more numerous in the left upper lobe, in which there was also a caseous nodule a little over 2 mm. in diameter.

Bronchial Glands.—Those on the right side appeared normal. On the left side the praetracheo-bronchial gland was slightly enlarged and caseous throughout. Two intertracheo-bronchial glands each contained a caseous focus.

A vertebral gland in the ninth interspace was enlarged and in a state of early caseation.

Brain, Uterus, Thyroid Body, Inguinal Glands, Axillary Glands.—Normal.

Microscopical Examination.

Right Tonsil.
Right-Mid Cervical Gland. } No tubercle bacilli.

Mesenteric Gland (Emulsion.)—A few tubercle bacilli.

Spleen -
Liver - } No tubercle bacilli.

Guinea-Pigs Inoculated.

With emulsion of caseo-pus from Mesenteric Glands:—

G.P. 1369. inoculated subcutaneously, died of general tuberculosis in 51 days.

G.P. 1370. inoculated intraperitoneally, died of general tuberculosis in 23 days.

BABOON 30. (Young, East African.)

Fed with Milk of Cow 172 from September 9th, until October 4th (twenty-five days)

Amount of Milk Consumed—About 2,000 cubic centimetres.

Died—October 9th, 1904. 30 days after the first feed.

Clinical History.

Was first noticed to be ill on October 1st; he was less lively, did not eat his food well and seemed weak; during the next few days he got progressively worse; the weakness increased and he became much collapsed; the temperature varied between 34° and 31°C.; movements became incoordinate and tremulous. On the day preceding his death he was quite collapsed and lay on the floor of his cage in a peculiar rigid condition; the extremities, ears and nose were quite cold; there was some diarrhœa, the motions containing much undigested milk.

Tuberculin Tests before Experiment.

1. July 6, 1904.—Dose of tuberculin, 0·5 cubic cc. Rise of temperature, 0·8°C.
2. August 1, 1904.—Dose of tuberculin, 1·0 cc. No rise of temperature.

POST-MORTEM EXAMINATION.

Body.—Somewhat emaciated.

Tongue, Tonsils, Pharynx.—Normal.

Submaxillary Glands.—Two left submaxillary glands, one the size of a pea, the other three or four times that size, were caseous and softened throughout.

Right submaxillary gland normal.

Right Retro-Pharyngeal Glands, Cervical Glands.—Normal.

Left Retro-Pharyngeal Gland.—Was slightly enlarged and contained a softened caseous focus.

Abdomen:

Omentum.—Was devoid of fat, but showed no tubercles.

Peritoneum.—Normal.

Stomach.—The mucous membrane showed a hæmorrhagic erosion.

Small Intestine.—Normal.

Large Intestine.—Thickly studded, especially in the upper part, with pea-sized submucous nodules, the size of a pea; these contained dark grumous material and slender worms.

Mesenteric Glands.—Normal.

Ileo-Colic Glands.—An ileo-colic gland was slightly enlarged and showed on section two softened caseous areas in the cortex.

Colic Glands.—Normal.

The Spleen contained half a dozen yellow caseous nodules, ranging in size from 1·5 up to 4 mm. in diameter; the larger nodules were entirely softened.

A gland in the hilum of the spleen contained a caseous focus.

The Liver, except for one very minute greyish point, just beneath the capsule, appeared normal throughout.

Portal Gland.—Normal.

Kidneys.—Right kidney showed in the cortex a grey tubercle, about 0·5 mm. in diameter, with a minute whitish central point. Left kidney normal.

Suprarenal Bodies.—Normal.

Coeliac Gland.—The coeliac gland contained two minute caseous foci.

Thorax.

Lungs.—The left lower lobe was closely adherent to the diaphragm and the lower part of the chest wall by old fibrous adhesions; the rest of the left lung was fixed to the chest wall, but by more recent adhesions.

The left parietal pleura was profusely covered with grey slightly raised tubercles, about 1 mm. in diameter, some of which had opaque centres; around the lower part of the left pleura there was a thick layer of reddish granulation tissue.

Between the base of the lower lobe and the diaphragm there were several spaces, communicating one with the other, filled with thin brownish yellow pus; the walls of these spaces were formed by thickened pleura, which internally had a roughened greyish yellow appearance.

The serous surface of the lung (except the basal portion) showed numerous grey granules.

The upper lobe was intimately adherent to the lower lobe, the line of union being marked by a band of fibrous tissue. In the substance of the upper lobe there was one pin-head sized tubercle.

At the base of the lower lobe there was a nodule the size of a large marble, consisting almost throughout of yellowish white caseated tissue; the caseous part was surrounded by reddish consolidated lung tissue; the rest of this lobe, except for one isolated tubercle, was normal.

The right lung was free from adhesions. In the upper lobe there were three caseous tubercles, the size of pins' heads; in the middle lobe there was one, and in the lower lobe three or four similar tubercles; in the lower lobe there was also a large purplish consolidated patch (pneumonic).

Bronchial Glands.—Those on the right side, in front of the bronchus, were normal. On the left side, and in the angle formed by the bifurcation of the trachea there was a series of six very enlarged glands; some of these were entirely softened, containing thin brownish yellow pus; others were closely beset with yellowish white caseous nodules.

In front of the trachea, just within the thorax, there were two enlarged and caseating glands.

Heart and Pericardium: No nad.

Brain and Membranes, Testicles, Lumbar Glands, Iliac Glands, Inguinal Glands.—Normal.

Microscopical Examination.

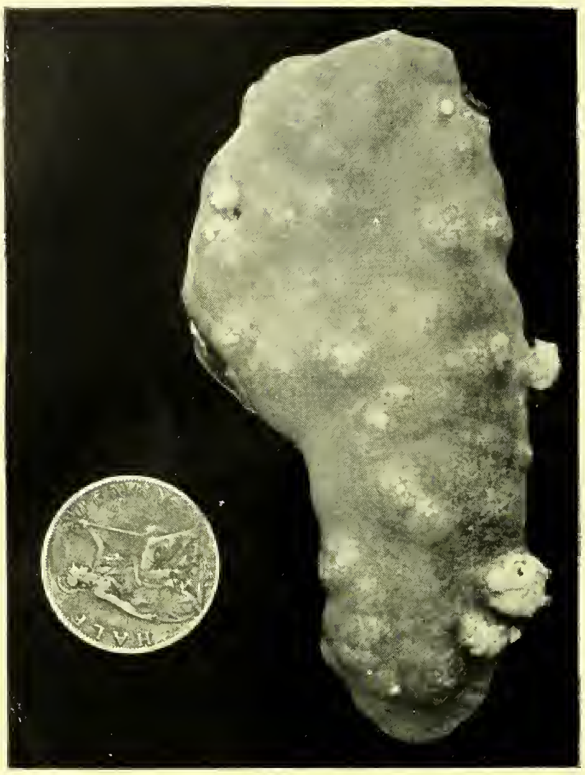
Smears from:

Ileo-Colic Glands, Lung, Scraping from Pleura, Liver, Kidney.—No tubercle bacilli.

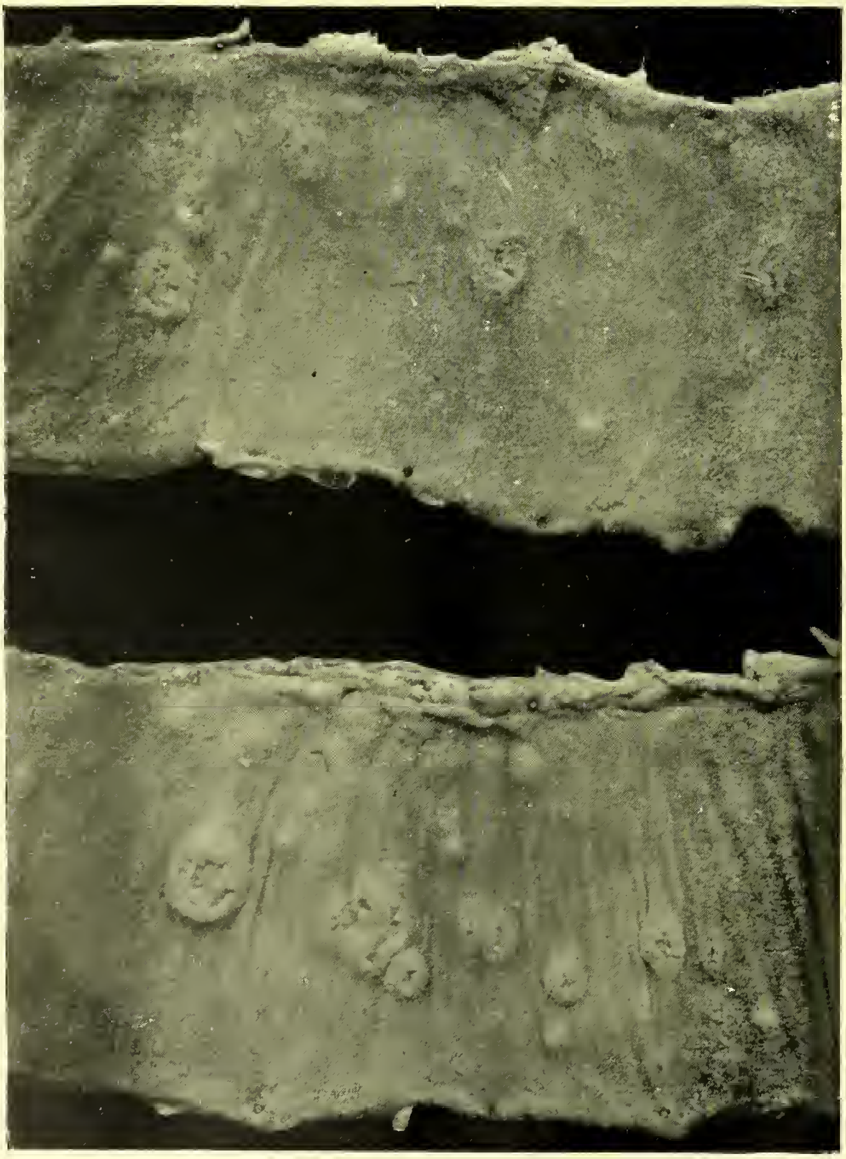
Guinea Pigs.

Guinea-pig 1,311 inoculated intraperitoneally with emulsion of lung nodule; died of general tuberculosis in 64 days.

Guinea-pig 1,312 inoculated intraperitoneally with emulsion of spleen; died of general tuberclosis in 57 days.



BABOON 22. Fed with milk of Cow 172 (Virus B. IV.).
Spleen, convex surface.



BABOON 22. Fed with milk of Cow 172 (Virus B. IV.).
Small intestine, showing tuberculous ulcers.

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BABOON 22. (Adult Female.)

Fed with Milk of Cow 172 from September 9th, 1904, until October 4th, 1904.

Duration of Feeding—25 days.

Amount of Milk Consumed—2,000 cc.

Died—December 8th, 1904. 90 days after the experiment began.

Clinical History.

The general health was unaffected until about the middle of November; she was then noticed to be quieter than formerly; her appetite, however, remained good and there was no apparent loss of flesh; subsequently the appetite became poor and there was obvious wasting and progressive weakness. Towards the end she became very quiet and would sit dejectedly in a corner of the cage with arched back and bowed head. She died on December 8th, 1904, 90 days after the first feed. No increase of respiration was noted during the experiment and there were only occasional attacks of diarrhœa.

Temperature.

The temperature of this animal was taken occasionally, but owing to her considerable objection to the operation daily records could not be secured.

Tuberculin Test before Experiment.

August 1, 1904. Dose of tuberculin, 2·0 cc. No reaction.

Not tested after experiment.

POST-MORTEM EXAMINATION.

Body.—Thin, but not markedly emaciated.

Tonsils.—Both tonsils were enlarged, the right more than the left; the mucous membrane over them was not ulcerated, but the opening of the right tonsil was enlarged. On section the right tonsil showed in the centre a caseous and softened mass, the left two caseous foci.

Several of the lymphoid follicles at the base of the tongue on the left side were ulcerated and caseous in the centre; two or three on the right side were in a similar condition.

Soft Palate, Pharynx.—Normal.

Right Submaxillary Glands.—Normal.

Left Submaxillary Glands.—Two of the left submaxillary glands were slightly enlarged; each contained one or two caseous tubercles, the size of a shot.

Right Pharyngeal Gland.—The size of a thrush's egg, was completely converted into an irregular softened pulpy caseous mass. A small gland attached to the capsule of this gland was caseous throughout.

Left Pharyngeal Glands.—On the left side there were two glands, one the size of a pea, the other twice as large; the large one was entirely caseous; the small one showed a caseous focus.

Immediately below these two glands there were two small glands, both of which were caseous throughout (the latter glands lay behind the carotid artery).

In front of the carotid, in the upper part of the left anterior triangle, there was a gland the size of a thrush's egg, which resembled the right pharyngeal.

Right upper cervical gland unaffected.

Thyroid Bodies.—Left normal. The small lymphatic gland that lies embedded in the substance of the thyroid just under the capsule, on the right side, was caseous throughout.

Lower cervical glands normal.

Abdomen:

The peritoneal cavity contained from 30 to 40 cubic centimetres of yellow slightly turbid serous fluid.

Omentum.—The omentum was not retracted, but was profusely covered with discrete grey translucent tubercles, which ranged in size from a rape seed to a millet seed; some of the larger ones had opaque whitish centres.

Peritoneum.—The parietal peritoneum showed on the floor and on the right side a thick eruption of minute transparent tubercles; there were also scattered about some soft flattened tuberculous growths from 2 to 3 mm. in diameter. On the left side there were similar tubercles, but not so numerous.

Stomach.—The mucous membrane at the cardiac end showed six circular ulcers, the largest about 4 mm. in diameter, with raised margins and slightly thickened caseous bases; there was also a submucous caseous nodule, the size of a pea. The pyloric end of the stomach was normal.

Intestines.—The mucous membrane of the upper half of the small intestine was covered with prominent ulcers, ranging in size from 3 to 4 up to 12 mm. in greatest diameter: some were circular, but most were longer in one diameter than in another and lay with the long axis transverse to the length of the bowel; the ulcers had very raised irregular margins and thickened caseous bases; they appeared to have originated in the solitary lymphoid follicles, and so numerous were they that all these structures must have been affected. The peritoneum over them was thickened and studded with caseating tubercles of various sizes. Besides the ulcers there were several pea-sized caseous nodules, over which the mucous membrane was intact.

The third part of the duodenum was firmly adherent to and closely incorporated with the upper extremity of the mass of mesenteric glands. This part of the intestine, viewed from the mucous surface showed great proliferation of the mucous membrane and two or three secondary ulcers, through one of which caseo-pus could be discharged by squeezing the mesenteric mass; the muscle walls of this part were completely destroyed by caseation.

One foot lower down the wall of the bowel, at its mesenteric attachment, was greatly thickened (greatest thickness nearly 1 cm.), over an area two inches in diameter, and extensively caseated: the mucous surface was raised and nodular.

The greater part of the ileum was normal, but in the last twelve inches there were numerous tuberculous ulcers; these occurred in groups and were situated in Peyer's patches; the serous surface was studded with miliary tubercles.

The upper part of the large intestine showed six raised ulcerated caseous nodules, the largest 1 cm. in greatest length. The rest of the large intestine was normal.

Gastric Glands.—Precardiac enlarged and partly caseous. The gland in the small curvature was normal.

Mesenteric Glands.—The mesenteric glands were very greatly enlarged and fused together to form a semi-fluctuant mass, measuring 3 in. x 2 in. x about 1¾ in.; the peritoneal surface had a dense cicatricial appearance and was studded with prominent caseous tubercles, the largest the size of a small pea. On section the mass was caseous throughout and irregularly softened, and was surrounded by a thick fibrous capsule; at its upper extremity it was closely adherent to that part of the duodenum which lies below the head of the pancreas (*see* above). Along the left border of the mass the mesentery was greatly thickened, shortened, and closely studded with pea-sized caseous nodules. Lower down the mesentery was much less thickened and there were fewer nodules; in this part numerous thick white tortuous lymphatic vessels were seen. The mesentery attached to the lower half of the intestines was not thickened, but the blood vessels were dilated and there were numerous pin-head-sized tubercles on the surface. The latter became less numerous as the caecum was approached.

On the right border of the mass of mesenteric glands, between it and the first part of the colon, were four or five larger more or less detached glands, which were caseous throughout.

Ileo-Colic Glands.—On each side of the ileo-cœcal junction there was a chain of six to eight glands, ranging in size from a large pea to a thrush's egg, which on section were caseous throughout.

Colic Glands.—One on the first part of the colon, the size of a marble, was caseous throughout; a small gland near this showed a caseous focus; other colic glands along the skirt of the meso-colon were normal.

In the meso-colon, near the sacrum, there were two caseous glands, the largest 1 cm. in diameter.

On the surface of the meso-colon there were fairly numerous tubercles. mostly the size of pins' heads, but one or two that of a wheat grain; the latter were yellow and caseous.

Spleen.—Greatly enlarged, contained numerous yellow softened nodules, with caseo-purulent contents, ranging in size from 3 to 10 mm. in diameter; several caused hemispherical projections under the capsule.

Two of the glands in the hilum of the spleen showed caseous foci.

Liver.—Enlarged. Right lobe adherent to the diaphragm. When removed the convex surface of the right lobe was seen to be covered with irregular patches of a thin greyish yellow membrane; projecting from both surfaces, but more prominently from the concave, were numerous yellow caseous nodules ranging in size from a pin's head to a split pea: on the convex surface many of the nodules were "mushroomed" and surrounded by a grey filmy margin. On section numerous similar nodules were scattered throughout the substance: some of these had softened bile-stained centres. Besides the larger nodules the liver substance showed very numerous grey foci, just macroscopically visible.

Portal Glands.—A gland in the hilum of the liver contained numerous yellow caseous areas about 2 mm. in diameter.

In the small omentum there was a gland the size of a filbert, which contained similar, but more numerous areas.

Kidney.—Left kidney showed in the cortex two caseous nodules 3 mm. in diameter, each surrounded by a zone of congestion.

Right kidney showed a similar nodule, 5 mm. in diameter.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Muscle and valves normal.

Lungs.—The base of the right lung, and slightly also that of the left, were adherent to the diaphragm by recent adhesions; the upper and lower lobes on each side were adherent to each other.

The lungs were crammed with nodules that varied in size from a small pea to a large marble; they were distributed evenly throughout the substance and on section were caseous throughout, the largest ones being softened. The lung tissue between the nodules was normal in colour and there were no patches of consolidation.

Bronchial Glands.—Were deeply pigmented and slightly enlarged; they each showed a few caseous nodules 2 to 4 mm. in diameter.

Mediastinal Glands.—A dorsal mediastinal gland, near diaphragm, was enlarged and caseous throughout.

Pleura.—On the left side there was a small flattened caseous nodule; on the right side the fringes along the margins of the last four ribs were hypertrophied and contained scattered translucent tubercles.

Diaphragm.—Pleural surface. On the left side around the margins of the tendon, there were several flattened caseous nodules surrounded by pinkish granulation tissue. On the right side there were a few similar nodules, and around the margin of the tendon, extending on to the muscle, a layer of granulation tissue.

Peritoneal surface. Left side normal. The right side was covered with flattened irregular caseous patches and plaques of vascular vegetations.

Lumbar Glands.—Three enlarged glands on the left side were fused together to form a mass 2 in. in length and $\frac{2}{3}$ in. in thickness; all were caseous throughout. On the right side there was a similar but smaller mass.

Ilio-Sacral Glands.—One ilio-sacral gland was enlarged and beset with caseous foci, up to 2 mm.

Uterus, Ovaries, Axillary Glands, Inguinal Glands.—Normal.

Microscopical Examination.

Cervical Glands.—Tubercle bacilli fairly numerous.

Thyroid Body.—(Caseous gland.) No tubercle bacilli found.

Right Tonsil.—Tubercle bacilli fairly numerous.

Stomach:

Submucous Nodule. } A few tubercle bacilli seen
Ulcer. } in each.

Bronchial Gland.—Six tubercle bacilli found.

Left Kidney.—No tubercle bacilli.

Guinea-Pig 1378, inoculated intraperitonally with 4 cc. peritoneal fluid, died of general tuberculosis in 64 days.

BABOON 20. (Adult Male.)

Fed with Milk of Cow 172 from September 9th, 1904, until October 4th, 1904.

Duration of Feeding—25 days.

Amount of Milk Consumed—2,000 cc.

Killed—when very ill, December 3rd, 1904. 85 days after the experiment began.

Clinical History.

Became ill about the same time as Baboon 28. Before experiment he was a most active and playful animal; the change in his condition was therefore more quickly noticed than in Baboon 22, but afterwards the illness ran a practically identical course.

Temperature.

The temperature was not taken until October 29th; from this date morning and evening observations were made until the end of the experiment.

The first fortnight's records showed an irregular type of pyrexia, the morning temperatures being generally normal, or slightly above normal, the evening ones rising sometimes over one degree (maximum 40·3°C.). For a fortnight after the tuberculin test the temperature was steadier and only slightly raised above normal. Finally the temperature was subnormal and showed very irregular fluctuations, rising on one occasion from 34·9° in the morning to 37·2° in the evening.

Tuberculin Tests.

(Before Experiment).—July 6, 1904. Negative. Dose of tuberculin: 1·0 cc.

August 1, 1904. Negative. Dose of tuberculin: 2·0 cc.

Tuberculin Test.

Fifty-three days after the beginning of the experiment. Positive. Rise of temperature: 1·6°C. Dose of tuberculin: 2·0 cc.

The temperature rose to its maximum, 41·2°C., three hours after the inoculation of tuberculin; it remained high for three hours and then began to fall; at the fifteenth hour it was normal.

There was marked general disturbance (depression, loss of appetite, and diarrhœa), and considerable local pain, but no swelling; the inoculation was made on the inside of the thigh and the leg was held stiffly for several days.

POST-MORTEM EXAMINATION.

Body.—Somewhat emaciated.

Tonsils.—Both tonsils were enlarged and showed on the mucous surfaces numerous irregular ulcers, with abrupt undermined edges and yellow caseous floor; the intervening mucous membrane was raised thickened and congested. On section the body of each tonsil was caseous.

Tongue.—Many of the lymphoid follicles at the base of the tongue were enlarged caseous and ulcerated.

Submaxillary Glands.—On the right side one, the size of a pea, was caseous throughout; a second showed a congested caseous focus. On the left side there were two glands; one was normal, the other contained a caseous focus.

Left submaxillary salivary gland showed a caseous nodule, 2 millimetres in diameter, surrounded by a zone of congestion.

Retropharyngeal Glands.—On the left side there was a mass of glands, 1½ by 1 in. by ¾ in., which on section were found to be entirely converted into soft pulpy caseous tissue. On the right side there was a similar but smaller mass.

Parotid Lymphatic Glands.—Normal.

Cervical Glands.—On the right side the upper cervical gland was enlarged to the size of a filbert and was caseous throughout; in the middle of the neck two glands were fused together to form a mass the size of a broad bean; on section both glands were caseous throughout and softened. In the posterior triangle behind the clavicle there were two enlarged caseous glands.

On the left side the upper cervical gland was the size of a filbert, caseous throughout and beginning to soften; a gland lower down in the neck, on the carotid artery, was enlarged and beset with caseous foci; the glands behind the clavicle in the posterior triangle were normal.

Abdomen:

The peritoneal cavity contained from 50 to 60 cc. of yellowish-brown turbid fluid.

Peritoneum.—The parietal peritoneum on the floor and on the left side was profusely studded with translucent miliary tubercles; in the neighbourhood of the spleen the tubercles were yellow and opaque, and were very closely aggregated together over a large area.

On the right side of the peritoneum the tubercles were sparsely scattered.

Omentum.—The omentum was thickened retracted and closely covered with caseating nodules, varying in size from that of a mustard seed to that of a wheat grain; in several places, chiefly near the spleen, the nodules had run together to form small irregular masses.

Stomach.—On the serous surface there were five projecting caseous tubercles, the largest the size of a millet seed. On the mucous surface, near the cardiac orifice, there was a raised area 2 by 1 cm., which showed at one end a deep puckered ulcer; on section the submucous tissue was thickened and caseous. Near this was another elevation 1 cm. in diameter, with a central ulcer extending through the mucous membrane and communicating with a space in the submucosa, in which there was a small amount of caseous débris; just below the opening of the œsophagus there was a small ulcer with raised edges.

* *Small Intestine.*—The mucous membrane of the small intestine showed about twenty widely distributed ulcers; the majority of these were small and circular, with raised margins and slightly thickened caseous base (in some only a few caseous foci could be seen). In the lower part of the upper third of the intestine, where the ulcers were most numerous, there were five or six larger ulcerated areas; two of these almost completely encircled the bowel, the largest measuring 3·5 by 1·2 cm. They each showed two ulcers, one large and irregular, on the convexity; the other a smaller one (probably more recent), situated nearer the attachment of the gut. The large ulcers had very raised irregular margins and thickened caseous base; they involved all the wall of the bowel, and were seen on the peritoneal surface as slightly constricting whitish yellow areas, studded with a varying number of projecting caseous tubercles; attached to the centres of these areas were slender processes of connective tissue.

The small ulcers showed no subperitoneal tubercles and were seen on the serous surface in two or three instances as whitish elevations, due to local thickening of the peritoneum.

Many of the lymphatic vessels proceeding from those parts of the bowel in which were situated the larger ulcers were thickened opaque white and in some cases showed strings of minute tubercles along their whole length; in other parts of the mesentery the lymphatic vessels appeared to be distended.

Large Intestine.—Cæcum: on the serous surface there were three caseous tubercles; mucous surface normal.

The ascending colon showed an eminence 8 mm. across, in the centre of which there was a crateriform ulcer with caseous margins and base; the peritoneum over it was thickened; in the transverse colon there was a small ulcer with raised margins. Near the rectum there was a rounded elevation 5 mm. in diameter, with a small central ulcer and caseous interior.

* *The Mesenteric Glands* were hugely enlarged and fused together into a mass 3½ in. by 1½ in. by 1⅓ in.; the peritoneal surface had a dense white appearance and was studded with projecting caseous tubercles, the largest the size of a wheat grain. On section the glands were caseous throughout and irregularly softened; the capsules were greatly thickened.

At the margin of the mass, between it and the colon, there were three or four œdematous hæmorrhagic glands, which contained small caseous nodules.

Ileo-Colic Glands.—Three on each side, were enlarged and caseous throughout, with one exception; this was distended with blood-stained fluid and showed discrete caseous foci.

Colic Glands.—Two on the first part of the colon were enlarged and caseous throughout. On the descending colon there were two caseous glands, each about 1 cm. in diameter. The rest of the colic glands were œdematous, but with the exception of one or two which showed caseous foci were otherwise normal.

Cœliac Glands.—Two cœliac glands, one the size of a large marble, the other that of a pea, had very thick capsules, and were caseous throughout.

Lumbar Glands.—Were greatly enlarged fused together and extensively caseated.

Iliac Glands.—The right iliac gland was the size of a French bean and was caseous in more than half its extent. The left was normal.

Spleen.—Was enlarged to two or three times the normal. On the capsule there were a few scattered grey tubercles; the pulp contained numerous yellow caseous and softened nodules, ranging in size from about 0·5 to 1·5 cm. in diameter; several projected prominently beneath the capsule, one large one on the convex surface being adherent to the parietal peritoneum in the centre of the eruption of yellow tubercles (previously described).

In the hilum of the spleen there was a group of enlarged glands; one, the size of a broad bean, was caseous throughout; two others were partly caseous, and two or three showed caseous foci.

Liver.—Showed on the surface and on section numerous yellow caseous nodules, 1·5 to 8 mm. in diameter; besides these there were innumerable whitish specks.

Portal Gland.—Size of a filbert, contained numerous caseous and softened patches.

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* *See* Plate 2.

Kidneys.—On the surface of the right there were numerous tubercles, ranging in size from 1 to 2 mm. in diameter; the smaller ones were grey and translucent, the larger ones opaque and caseous in the centre. On section similar tubercles were seen in the depth; one slightly larger than the rest was about 3 mm. in diameter.

The left kidney showed similar tubercles.

Many of the tubercles were hæmorrhagic and the surface of the kidney was spotted with petchial points. No tubercles seen in the medullary zones.

Suprarenal Bodies.—Normal.

Thorax :

Heart.—Muscle and valves normal.

Lungs.—Slightly pigmented, packed with hard nodules, ranging in size from a small shot to a very large pea; they were evenly distributed throughout the substance, those on the surface forming marked subpleural projections. On section they were firm yellowish white and entirely caseous, except for a narrow grey translucent peripheral zone.

Bronchial Glands.—Were deeply pigmented. Those on the left side appeared to be normal; on the right side the praetracheo-bronchial gland was normal, two of the intertracheo-bronchial glands showed in the cortices three or four opaque white points.

A gland in the inferior part of the posterior mediastinum was enlarged and beset with caseous foci.

Parietal Pleura.—That covering the ribs was normal.

Diaphragm.—On the pleural surface on the left side, around the margins of the tendon, there were several hard tubercles, surrounded by slightly developed tuberculous vegetations; in the centre of the tendon there were some transparent villi; On the peritoneal surface, chiefly over the muscle, there was an eruption of minute almost transparent tubercles; there were besides scattered opaque caseous tubercles, the largest the size of a millet seed; these occurred chiefly on the left side.

Testicles, Inguinal Glands, Axillary Glands.—Normal.

Microscopical Examination. (*Smear preparations.*)

Peritoneal Fluid.—One or two short tubercle bacilli seen.

Liver.—One tubercle bacillus.

Lung.—One or two tubercle bacilli.

Spleen.—No tubercle bacilli.

Kidney.—One tubercle bacillus.

Submaxillary Gland.—No tubercle bacilli.

A guinea-pig inoculated intraperitoneally with 4 c.c. of peritoneal fluid died of general tuberculosis in 81 days.

BABOON 40. (Young.)

Fed with Culture derived from the original material of Virus B. IV. (Fed at the same time as Chimpanzee 2, and with an equivalent dose of culture.)

Dose—1·0 milligramme.

Date—November 1st, 1904.

Died—December 8th, 1904. 37 days after the experiment began.

Clinical History.

No definite signs of illness were observed during the experiment.

There is no way of accounting for the early death of the animal except that it died of cold, which at that time was exceptionally severe.

Tuberculin test before experiment. Negative.

Temperature.

During the first fortnight the temperature was normal or sub-normal (maximim 38·3°C); on the fourteenth day it rose sharply to 39·6°C. but quickly fell, and during the rest of the experiment fluctuated between 37·1°C. and 39·2°C.

POST-MORTEM EXAMINATION.

Condition.—Fair.

Tonsils.—Left tonsil normal.

Right tonsil seemed a little enlarged and hardened, but showed no visible foci. (Tubercle bacilli found.)

Pharyngeal Mucous Membrane.—Normal.

Submaxillary Glands.—One right submaxillary gland was enlarged to the size of a small olive; on section it showed more than three-quarters of the substance caseous and softened.

On the left side there was a group of six glands, ranging in size from a split pea to that of a kidney bean; the largest was partly caseous; the rest showed caseous and softened foci in the cortices.

Pharyngeal Glands.—Extending from the base of the skull on the left side to the level of the upper border of the thyroid there was a chain of four small glands; the largest contained in the centre a caseo-purulent mass replacing half the substance; two others were beset with soft caseous foci, the largest 2 mm. across; the fourth was normal.

On the right side, behind the tonsil, there were two fused glands, each the size of a swallow's egg; on section they showed softened caseous areas, which almost entirely replaced the gland substance.

Cervical Glands.—Left mid-cervical gland was slightly enlarged and showed in the cortex minute congested caseous foci.

Deep cervical glands normal.

On the posterior surface of the trachea on the right side, just below the thyroid cartilage, there was an enlarged gland beset with softened caseous foci.

Thyroid Body.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Stomach.—Normal on both surfaces.

Intestines.—The mucous membrane of the lower third of the small intestine showed ten minute ulcers with congested edges; these were felt between the finger and the thumb as slight thickenings and on section were just perceptibly caseous at the bases. The majority of the ulcers were situated in Peyer's patches, some of which showed three or four. There were no subperitoneal tubercles, but on the peritoneum opposite one there was a fringe of fibrin.

Pyloric Gland.—Normal.

Mesenteric Glands.—Five or six of the mesenteric glands in the lower part of the mesentery were slightly enlarged and hardened. On section they showed in the cortices softened caseous foci, some of which were purulent. The glands in the upper part of the mesentery were normal.

Ileo-Colic Glands.—One on each side was slightly enlarged; each contained scattered softened caseous foci.

Colic Glands.—Normal in size and appearance.

Spleen.—Not enlarged; no tubercles visible.

Liver.—Pale in colour, otherwise normal.

Portal Gland, Kidneys, Suprarenal Bodies, Coeliac Glands, Lumbar Glands, Iliac Glands, Inguinal Glands, Axillary Glands.—Normal.

Thorax.

Pleura, Pericardium.—Normal.

Heart.—Muscle and valves normal.

Lungs.—The left lower lobe showed a purple patch of congestion (hypostatic ?); all the lobes were crepitant throughout and free from macroscopic tubercles.

Bronchial Glands.—Deeply pigmented; otherwise normal.

Diaphragm.—Normal.

Microscopical Examination.

Right Pharyngeal Gland.—Three tubercle bacilli.

Mesenteric Gland.—Tubercle bacilli found.

Intestine. (Two ulcers.) Tubercle bacilli fairly numerous in both.

Right Tonsil.—A few tubercle bacilli.

Guinea-pig 1377, inoculated intraperitoneally with an emulsion made from the spleen, died of tuberculosis in 27 days.

BABOON 50. (Adult Male.)

Fed on December 14th, 1904, with culture derived from the original material of Virus B. IV. The culture was 20 days old, 10th generation.

Dose—1·0 milligramme.

Date—December 14th, 1904.

Killed—March 1st, 1905. 77 days after.

Clinical History.

The baboon showed no signs of ill-health during the experiment.

Tuberculin Tests.

December 12 h, 1904. Before experiment. Negative. Dose of tuberculin 2·0 cc.

February 3rd, 1905. After two temperatures had been taken, at the third and sixth hours respectively, the baboon slipped his collar and it was found impossible to secure him for further records. The two temperatures taken showed no rise and there was no constitutional disturbance during the twenty-four hours following the inoculation.

POST-MORTEM EXAMINATION.

Body.—In good condition.

Tongue, Tonsils, Pharynx, Submaxillary Glands, Pharyngeal Glands, Cervical Glands.—Normal.

Abdomen :

Omentum.—The omentum contained very numerous larvæ of a linguatulid; they were most numerous near the free margin. Similar parasites were seen under the parietal peritoneum (few), under the peritoneum covering the diaphragm, in the wall of the small intestine, in the mesentery, mesocolon and in the liver. All the mesenteric glands contained the parasite, the gland tissue in some being almost entirely replaced by them. There were about eight in the lungs, the majority being subpleural. The parasites were not definitely encapsulated; they appeared to lie in dilated lymphatic vessels. The liver spleen and kidneys were free from any sign of tuberculosis, also the intestines and mesenteric glands.

Portal Glands, Lumbar Glands, Iliac Glands.—Normal.

Thorax :

Heart, Pericardium.—Normal.

Lungs.—The right middle lobe was adherent to the chest wall and was enlarged and completely consolidated. On section, half the lobe (that nearest the root) was caseous; the rest was dark red and beset with miliary tubercles, some of which were opaque.

Other lobes of the lung were normal.

Thoracic Glands.—The right praetracheo-bronchial gland was enlarged caseous and softened in more than half its extent.

An intertracheo-bronchial gland was slightly enlarged, and contained a soft caseous mass and several caseous foci.

Left bronchial glands normal.

Microscopical Examination.

Bronchial Gland (two smears).—A few tubercle bacilli.

BABOON 52. (Young.)

Fed with Culture derived from the original material of Virus B. IV. The culture used was the 18th generation, 20 days old.

Dose—1·0 milligramme.

Date—December 14th, 1904.

Died—February 26th, 1905. 74 days after.

Clinical History.

There was no alteration in the general condition until about the end of January, when she was noticed to be weaker and to be losing appetite. The weakness gradually became more pronounced and there was appreciable loss of flesh; in the last few days there was some diarrhœa. She was found dead on February 26th, 74 days after being fed.

Tuberculin Test.

February 3rd, 1905, 51 days after the experiment began. Negative.

Weight.

During the first six weeks there was a steady gain in weight; then the animal began to lose weight, slowly at first, then rapidly.

	lbs.	ozs.
December 20th, 1904 - - -	8	4
January 10th, 1905 - - -	8	15
January 24th, 1905 - - -	9	4
February 7th, 1905 - - -	9	0
February 21st, 1905 - - -	8	4
February 26th, 1905 - - -	7	0
Gain in weight from December 20th, 1904 to January 24th, 1905 - - - - -	1	0
Loss in weight from January 24th to February 26th - -	2	4

Temperature.

The temperature during the experiment never rose higher than 39·6°C.

POST-MORTEM EXAMINATION.

Body.—Somewhat emaciated.

Tonsils.—In the position of the right tonsil, involving tonsil and neighbouring mucous membrane, there was a narrow deep ulcer, the sides of which were necrotic and covered with yellow discharge; the mucous membrane around the ulcer was congested.

On the left side there was a similar, but smaller ulcer.

Tongue.—The mucous membrane at the base of the tongue, near these ulcers, had a yellowish appearance and showed several little ulcers. On section the submucous tissue was seen to be caseating.

Palate.—On the buccal surface of the soft palate, a little to the left of the mid line, there was a funnel-shaped depression at the apex of which the mucous membrane was ulcerated; on section the submucosa was seen to be in a state of caseation.

The mucous membrane on the posterior wall of the pharynx and around the epiglottis showed numerous minute yellow foci (tubercle bacilli found).

Submaxillary Glands.—Normal.

Pharyngeal Glands.—On each side, behind the tonsils, there was a fused mass of glands measuring about one and a half inches in length and two thirds of an inch in greatest diameter, which on section were seen to be caseous throughout and entirely softened.

Sublingual Glands.—The sublingual gland on the right side, the size of a pea, was practically caseous throughout; that on the left side was slightly enlarged and contained caseating tubercles.

Along the left carotid artery there was a chain of ten glands, ranging in size from a wheat grain to that of a sparrow's egg; on section they were found to be filled with soft yellowish white caseo-pus.

Just above the clavicle, in the left posterior triangle, there was a pea-sized caseous and softened gland.

One of the left axillary glands contained a soft caseous nodule 2 mm. in diameter.

Along the right carotid artery there was a chain of glands similar to that on the left side.

In the right posterior triangle there was a series of small congested glands which did not show caseous foci.

Right axillary glands normal.

Abdomen:

The peritoneal cavity contained a small amount of turbid serous fluid.

Omentum.—Showed a few minute transparent foci which were probably early tubercles.

Stomach.—Normal.

Small Intestine.—Showed about twenty-four small ulcers and twelve large ulcerated areas, the largest of which measured 2 by 1 cm.

The latter were raised above the surface, the mucous membrane covering them being hæmorrhagic and ulcerated in patches. On section the submucosa and the muscular coats were entirely caseous (2 mm. in thickness); the serous surfaces showed a well marked tuberculous lymphangitis, the thickened lymphatic vessels in some of the cases extending all around the gut and into the mesentery as far as the mesenteric glands.

The small ulcers had raised margins and caseous bases, involving all the coats of the bowel except the peritoneal.

Several of the Peyer's patches contained caseous tubercles only (one seven or eight), most of which were ulcerated.

Large Intestine.—The cæcum showed two small ulcers with raised congested margins and yellow floors.

The colon showed one similar ulcer.

The Mesenteric Glands were greatly enlarged and fused together to form a yellow lobulated mass. On section the glands were seen to be practically caseous throughout and partially softened.

The Ileo-Colic Glands on each side were enlarged and almost entirely caseous and softened.

Colic Glands.—One colic gland was enlarged to the size of a pea and was caseous throughout and softened.

The Lumbar Glands on each side were greatly enlarged and similarly affected.

The Spleen was slightly enlarged. On section the pulp was packed with small yellow tubercles; it contained also a few yellow caseous nodules, 2 to 5 mm. in diameter, several of which projected on the surface. The small tubercles were seen through the capsule as yellow spots surrounded by a congested zone.

The glands in the hilum of the spleen appeared normal.

The Liver was closely beset with opaque greyish-white tubercles the size of rape seeds.

The Portal Gland was swollen and œdematous, but there were no foci of caseation.

Cœliac Glands.—A cœliac gland was enlarged and showed numerous foci of caseation.

The Kidneys were pale; the right showed in the depth of the cortex two small yellow tubercles.

Suprarenal Bodies.—Normal.

Thorax:

The pericardial sac contained a small amount of clear serous fluid.

Heart.—The cavities of the heart contained ante-mortem clot.

Heart muscle and valves normal.

Pleura.—The parietal pleura was free from tubercles.

Lungs.—The left lung was adherent on its dorsal surface to the ribs by fairly firm fibrous adhesions: there were a few slender strands between the right lung and the wall of the thorax. The left upper lobes were firmly adherent to the lower, and the lower lobe was adherent to the diaphragm.

Both lungs contained numerous caseous tubercles the size of a No. 4 shot: there were also eight larger caseous nodules (three in the left and five in the right), ranging in size from 5 to 10 mm. in diameter; there were no patches of consolidation.

The Bronchial Glands were greatly enlarged caseous and softened.

Mediastinal Glands.—The dorsal mediastinal glands (near the diaphragm) and the ventral mediastinal glands (behind the upper part of the sterum) were also caseous throughout and softened.

Brain and Membranes, Uterus, Ovaries, etc., Inguinal Glands.—Normal.

MICROSCOPICAL EXAMINATION.

Small Intestine (Tubercle in Peyer's patch)	Numerous tubercle bacilli.
Pharynx,	
Right Kidney,	
Spleen.	

BABOON 14. (Young East African.)

Fed with Culture obtained from Guinea-pig 14, Virus B. I. Table 1 A. The culture was the 29th generation, 19 days old.

Dose—5 milligrammes.

Date—June 8th, 1904.

Died—July 6th, 1904. 28 days after.

Clinical History.

The baboon was found on the morning preceding his death cold and collapsed outside the cage, from which he had escaped during the night. The cause of the collapsed condition was not ascertained; there was no sign of an injury and on the previous day the animal had appeared to be quite well.

POST-MORTEM EXAMINATION.

Body.—Somewhat emaciated.

Two of the lymphoid follicles at the base of the tongue, on the left side, contained dry whitish secretion, which did not easily shell out (a smear made from one of the collections showed no tubercle bacilli).

Tongue, Tonsils.—Normal.

Submaxillary Glands.—One left submaxillary gland was slightly enlarged and showed under the capsule in the substance a number of little yellowish white foci; on section these foci exuded whitish translucent pus.

The right submaxillary glands were normal.

Pharyngeal Glands.—The right retropharyngeal glands contained a softened focus similar to those in the submaxillary gland.

The left pharyngeal gland was normal.

Superficial and Deep Cervical Glands.—Normal.

Abdomen :

Parietal Peritoneum, Pleural Surface of Diaphragm.—Normal.

Omentum.—Sparsely scattered over the surface of the great omentum were minute transparent tubercles, smaller than grains of sand.

Stomach.—Was contracted across its middle (hour-glass).

Mucous membrane normal.

Small Intestines.—About fifteen inches from the pylorus there was beneath the mucous membrane a yellowish softened focus, the size of a pin's head. (Tubercle bacilli found.)

A few inches lower down an opaque whitish spot was seen, with a minute dark central point (enlarged solitary follicle ?); a smear preparation was made and numerous tubercle bacilli were seen.

A Peyer's patch two feet from the ileo-cæcal valve showed a soft yellow focus beneath the mucous membrane (numerous tubercle bacilli).

Two inches further on another Peyer's patch contained a nodule 2·5 mm. in diameter, caseous and softened in the centre; it projected above the surface of the patch, and could be felt between the finger and the thumb; the mucous membrane over the central part was ulcerated.

In the substance of a patch six inches from the valve there was a greyish white focus, which did not shell out.

Large Intestine.—At frequent intervals along the whole length of the large intestine there were numerous dark submucous nodules, the size of small peas; these on section were seen to be cysts filled with reddish grumous material; in each cyst there was a short slender worm; no ulceration of the mucous membrane.

(Similar parasitic cysts have not been seen in South African baboons.)

Glands along great curvature of stomach normal.

Mesenteric Glands.—Were not obviously enlarged. All those in the upper part of the mesentery (about six in number), showed beneath the capsule discrete whitish or yellowish white foci, ranging in size from 0·5 to 2 mm. in diameter; on section the foci contained soft whitish pus.

All the glands in the lower part of the mesentery appeared normal.

Ileo-Colic Glands.—Normal.

Meso-Colic Glands.—One meso-colic gland felt firmer and tenser than normal, but on section showed no naked eye evidence of tuberculosis.

Other meso-colic glands were normal in size and appearance.

Spleen.—Not enlarged. Normal on the surface; showed in the pulp scattered spherical yellowish bodies, the size of the head of a pin (early tuberculosis of Malpighian bodies).

Portal Glands, Coeliac Glands, Pancreatic Glands, Splenic Glands, Lumbar Glands, Iliac Glands, Liver.—Normal.

Kidneys.—Pale; capsules stripped readily; no visible tubercles.

Suprarenal Bodies.—Normal.

Thorax :

Heart.—Muscle and valves normal.

Lungs.—Pigmented; crepitant throughout; beneath the pleuræ were numerous hæmorrhagic foci.

In the right lower lobe, near the surface, there were three firm grey translucent tubercles, the size of pins' head, slightly opaque in the centre; in the depth of the lobe there was a yellow tubercle, twice the size of the above, softened in the centre (tubercle bacilli).

The rest of the lung was normal.

Bronchial Glands.—Not enlarged. Deeply pigmented.

An intertracheo bronchial gland on the right side showed three yellowish white pin-point foci.

A gland anterior to the bifurcation of the trachea showed a suspicious opaque grey white point.

Other bronchial glands were normal.

Parietal Pleura.—Normal.

Brain and Membranes, Inguinal Glands, Axillary Glands.—Normal.

Microscopical Examination (Smear Preparations).

Mesenteric Gland. *Lung.*	Very numerous tubercle bacilli.

Bronchial Gland.—Twelve tubercle bacilli.

Pharyngeal Follicle. *Spleen.* *Omental Tubercle.* *Submaxillary Gland.*	No tubercle bacilli.

Focus in Peyer's Patch.—Numerous tubercle bacilli.

Fluid from Fifth Ventricle.—No tubercle bacilli.

Guinea-Pigs Inoculated.

No. 1090, inoculated intraperitoneally with an emulsion made from the mesenteric glands, died in 18 days of acute tuberculosis.

No. 1091, inoculated intraperitoneally with an emulsion made from the spleen, died in a few days of an acute infection.

No. 1092, inoculated intraperitoneally with an emulsion made from the liver, died in 76 days of general tuberculosis.

No. 1093, inoculated intraperitoneally with an emulsion made from the kidney and killed 76 days later, showed general tuberculosis.

BABOON 16. (Adult, East African.)

Fed with Culture obtained from Guinea-pig 14—Virus B. I. Table 1 A. The culture used was the 20th generation, 19 days old.

Dose—5 milligrammes.

Date—June 8th, 1904.

Killed—July 7th, 1904. 29 days after.

Clinical History.

The baboon showed no sign of illness during the experiment.

Tuberculin Test.

July 6, 1904.—28 days after feeding. Positive, rise of temperature, 1·5° C. Dose of tuberculin, 1·0 cc.

POST-MORTEM EXAMINATION.

Condition.—Poor.

Tonsils.—Congested; no tubercle.

Left Pharyngeal Gland.—Contained two small softened nodules.

Right Pharyngeal, Submaxillary, Cervical, Stomach, Small Intestines.—Normal.

Large Intestine.—Showed a number of dark coloured thin-walled cysts beneath the mucous membrane. On section each cyst contained reddish brown, or black, grumous material, embedded in which was a short slender worm.

Mesenteric Glands.—Were not obviously enlarged The terminal one showed through the capsule a whitish speck (inoculated into a Guinea-pig); otherwise these glands were normal.

Ileo-Colic Glands, Coeliac Glands, Lumbar Glands, Iliac Glands.—Normal.

There was a slight excess of fluid in the peritoneal cavity.

Omentum.—Showed scattered pearly translucent tubercles (three to four dozen), the size of a small shot, one or two of which were slightly opaque in the centre.

Spleen.—Was normal in size; on section the Malpighian corpuscles were very conspicuous and apparently enlarged; no tubercles seen.

Liver.—Showed in the substance beneath the capsule three spherical yellow nodules, one 2 to 5 mm. in diameter, the others about 1·5 mm.; one of the latter was hard and chalky, the others softened in the centre. In addition, beneath the capsule, and scattered sparsely throughout the substance, were minute greyish white and yellowish white points.

Portal Glands, Splenic Glands, Pancreatic Glands.—Normal.

Kidneys.—In the cortex of the right kidney, immediately beneath the capsule, there was a spherical nodule 2 mm. in diameter, yellow and softened in the centre; there was also a small grey tubercle. In the deeper part of the cortex a larger nodule, 4 mm. in diameter, was seen; this was yellow and softened in the centre, grey and translucent at the periphery.

In the cortex of the left kidney there was a firm grey nodule 2 mm. in diameter, which had not begun to caseate.

Suprarenal Bodies.—Normal.

Thorax:

Heart.—Muscle and valves normal.

Lungs.—The apex of the left upper lobe was adherent to the chest wall; the other lobes were free from adhesions.

At the apex of the left upper lobe there was a solid nodule, 3 by $2\frac{1}{2}$ by $1\frac{1}{3}$ cm.; this on section showed greyish and greyish red translucent tissue, surrounding opaque yellow cheesy nodules, one of which had broken down to form a cavity filled with thin yellowish white pus; pleura covering nodule thickened and fibroid. The lower part of this lobe was dark red in colour and completely hepatised. On section it was seen to be closely beset with miliary caseating tubercles; a similar, but smaller, hepatised patch was situated near the sternal margin.

The left lower lobe showed a few hard translucent tubercles, usually about the size of a shot, and mostly just beneath the pleura.

Similar shotty tubercles were seen in both the upper and lower lobes on the right side. Many of these small tubercles were slightly opaque in the centre.

In the depth of the right middle lobe there was a pin-head sized caseating nodule.

Thoracic Glands.—In front of the left bronchus and lower part of the trachea there was a large fluctuating gland, $1\frac{1}{2}$ in. by 1 in. by 1 in. On section the capsule was thickened and enclosed yellowish white pus.

Other bronchial glands and the mediastinal glands appeared normal.

Pleura.—On the pleura covering the muscle of the diaphragm, there were several clusters of firm translucent nodules, ranging from 1 to 3 mm. in diameter; they occurred chiefly on the left side and many were surrounded by connective tissue outgrowths.

Brain and Meninges, Uterus, etc.—Normal.

At the seat of inoculation of tuberculin, in the left thigh, the subcutaneous tissues were congested and slightly œdematous.

The inguinal glands on the same side were enlarged and œdematous.

Microscopical Examination.

Smears from:

Right Kidney - - -	No tubercle bacilli.
Omental Nodules - - -	
Mesenteric Gland Emulsion -	
Lung - - - - -	

Bronchial Gland.—Moderately numerous tubercle bacilli.

Peritoneal Fluid - -	No tubercle bacilli.
Pharyngeal Gland - -	

Guinea-Pigs Inoculated.

No. 1094 inoculated intraperitoneally with an emulsion of the right inguinal glands was killed and found to be healthy.

No. 1095, inoculated intraperitoneally with an emulsion of the mesenteric glands and killed in 77 days, showed general tuberculosis.

No. 1096, inoculated intraperitoneally with an emulsion from the left lung (hepatised portion), died of general tuberculosis in 54 days.

No. 1097, inoculated intraperitoneally with an emulsion of spleen and killed in 77 days, showed general tuberculosis.

No. 1098, inoculated intraperitoneally with an emulsion from the kidney and killed in 77 days, showed general tuberculosis.

CALF 50.

Fed with Tuberculous Milk from May 18th, 1902, to June 28th, 1902.

Duration of Feeding—41 days.

Age at beginning of Experiment—3½ weeks.

Killed—October 16th, 1902. 151 days after the experiment began.

Clinical History.

The calf was suckled by its mother, Cow 500, from May 18th, 1902, to June 18th, 1902, and by its foster-mother, Cow 18, from June 19th to June 25th, 1902; both cows had been inoculated in two quarters of the udder with tissue emulsions, in one case made from the original material of Virus B. I., and in the other from the organs of guinea-pigs inoculated with the original material of Virus B. II.

Towards the end of July it was noticed that the calf was getting thinner. In the second week of August it began to breathe with some difficulty, inspiration being accompanied by a snoring noise; the difficulty was probably due to enlarged retro-pharyngeal glands. The calf gradually became thinner and weaker, and towards the end of the experiment had several attacks of diarrhœa.

Tuberculin Tests.

June 24th, 1902. 37 days after the experiment began. Positive. Rise of temperature 1·3°C.

August 12th, 1902. 86 days after the experiment began. Positive. Rise of temperature 2·3°C.

POST-MORTEM EXAMINATION.

Despite the emaciated appearance of the animal, the body contained a considerable quantity of fat.

Very extensive disease of the alimentary canal was found. On the dorsum of the tongue at the junction of the middle and posteror thirds near the middle line was a sessile mass as large as a big pea. This was possibly a normal structure hypertrophied; it contained calcareous points.

The lining mucous membrane of the tonsillar pits was thickened and contained numerous little caseating foci.

The posterior part of the nasal septum was thickened with tuberculous deposit.

Retropharyngeal Glands.—Behind the upper part of the pharynx was a large mass of caseo-calcareous glands, yellow and gritty on section, and of various sizes up to a pigeon's egg.

Several caseous glands were found along the œsophagus.

Abdomen:

The Œsophagus and Stomach were free from ulceration.

The Small Intestine on the other hand was riddled with ulcers: these were in many places irregular in shape and more or less continuous for several inches along the convex side. At other parts the mucous membrane contained nodules of caseous matter and was riddled with ulcers. These were in many places irregular in shape and more or less continuous for several inches along the convex side. At other parts the mucous membrane contained nodules of caseous matter which here and there had just broken through the mucous membrane, thus making little round ulcers; these were in places thickly aggregated together, while at other parts they were more isolated. The edges of the ulcers (large and small) were thickened, sometimes undermined, and contained nodules of yellowish caseous matter. The ulcers were most numerous in the upper part of the small intestine and became less frequent towards the lower end, while they were rare and small in the large intestine. Rarely on the peritoneal surface of the older ulcers were little pedunculated or sessile tubercles.

The Mesenteric Glands were greatly enlarged along the whole length of the intestines, being mostly about as large as pigeons' eggs, though many were much longer, extending continuously for several inches. They were hard yellow and gritty on section.

The Spleen was not enlarged, but contained a few, perhaps 8 or 12, small spherical white nodules as large as small peas.

The Liver was spotted regularly with whitish spherical nodules, the largest about 1 cm., each of which on section was caseous, gritty in the centre and surrounded by a zone of fibrous tissue. The nodules were remarkably distinct from the liver substance; some stood up prominently from the surface, while others were embedded in the liver substance. The liver substance itself was quite normal in appearance.

The Portal Glands were enlarged and showed caseous and slightly gritty nodules in the cortex.

Kidneys and Suprarenal bodies.—Normal.

Thorax:

Heart and Pericardium.—Normal.

Pleura.—Normal; there was no excess of fluid in the pleural cavities.

The Lungs contained a few (perhaps two dozen in all) pea-sized spherical caseous nodules slightly gritty in the centre.

The Bronchial and Mediastinal Glands were enlarged and showed patches of caseation in the cortex, slightly gritty from calcification.

Other Lymphatic Glands.—Were normal.

Uterus, Ovaries and Pancreas.—Normal.

Microscopical Examination (Smear Preparations).

Margin of an Intestinal Ulcer.—Tubercle bacilli not found.

Liver.—Tubercle bacilli found.

Spleen.—Tubercle bacilli found.

A Paraffin Section of the pharyngeal portion of the thickened nasal septum showed a few tubercle bacilli.

Guinea-Pigs Inoculated.

Two inoculated with an emulsion made from the spleen and two with an emulsion made from the liver died of general tuberculosis.

BULL 22.

Fed with Tuberculous Milk from Cow 4 (the mother of the calf) from May 18th, 1902, to June 20th, 1902.

The calf sucked its mother from the day following her inoculation in the udder until her death, a period of 34 days, and was afterwards fed on ordinary food; the calf was 12 weeks old when the experiment began.

Killed—May 16th, 1903. 363 days after the experiment began.

Clinical History.

During the time that the calf was taking tuberculous milk the general health of the animal did not appear to be very good, although there were no definite signs of illness. The temperature was first taken 26 days after the experiment began; it was then high, 40·7° C. and remained raised with a tendency to fall until July 8th, 52 days after the experiment began; subsequently the temperature was practically normal throughout. With the fall in temperature the animal improved very much in its general condition and eventually grew into a very fine bull.

Weights.

The animal was weighed first on December 10th, 1902, and showed during the rest of the experiment a steady, though not uniform, increase in weight.

	cwts.	qrs.	lbs.
December 10th, 1902 - -	4	0	27
May 12th, 1903 - - - -	5	2	14
Gain in weight from December 10th, 1902 - -	1	1	15
Rate of gain per week -			7·1

Tuberculin Tests.

June 24th, 1902. (37 days after experiment began.) Positive. Rise of temperature, 1·0° C.

August 12th, 1902. (86 days after experiment began.) Positive. Rise of temperature, 1·4° C.

February 25th, 1903. (283 days after experiment began.) Positive. Rise of temperature, 2·4° C.

May 14th, 1903. (361 days after experiment began.) Positive. Rise of temperature, 2·4° C.

POST-MORTEM EXAMINATION.

General Condition.—The animal was moderately well nourished.

On reflecting the skin covering the right shoulder and upper part of the right leg a large area of the subcutaneous tissue was seen to be infiltrated with oedema fluid. (Result of tuberculin test 60 hours previously.)

Tongue.—Normal.

Palate.—On the nasal aspect of the palate was a raised nodule in the mucous membrane, about ½ in. by ¼ in., which on section showed yellow caseous points.

Tonsils.—Normal on section.

Left Submaxillary Lymphatic Gland.—Enlarged, and showed nine or ten caseous nodules about 4 mm. in diameter.

Right Submaxillary.—Normal.

Cervical Glands.—On the left side were two enlarged glands which showed on section several large caseous nodules. One gland on the right side was in a similar condition. The other glands were normal.

Posterior Pharyngeal Glands :

Right.—Greatly enlarged and showed on section caseous nodules.

Left.—Normal.

Oesophagus.—Normal.

Omentum, Gastric Glands.—Normal.

Small Intestine.—The Peyer's patches, throughout almost the whole length of the small intestine, showed tubercles of various sizes. In the early part of the duodenum the tubercles were small (about the size of a wheat grain) and embedded in the midst of the Peyer's patch ; on section they were greyish yellow and were fairly easily shelled out ; the mucous membrane over them was intact ; these tubercles were few in number and were not found in all the duodenal Peyer's patches.

In the jejunum the tubercles in the patches were larger (about the size of a pea) and more numerous, and were visible through the mucous membrane as yellow foci ; lower down some of these yellow foci protruded slightly through the mucous membrane and gritty particles could be felt on rubbing the finger over them.

Along the ileum the surfaces of the Peyer's patches became more and more irregular and showed prominent nodules, many half an inch in diameter and a quarter of an inch in thickness. Over the larger of these masses the mucous membrane had ulcerated away, exposing caseo-calcareous material and forming small moderately deep ulcers, the edges of which were heaped up thickened and inverted ; around the ulcers the mucous membrane seemed puckered. Many of the large nodules showed instead of a single large yellow mass, a number of small yellow points, some of which projected through the mucous membrane.

In addition to the large nodules were numerous smaller ones, varying from the size of a pinhead upwards ; most of these were covered by mucous membrane, but some were exposed and formed small ulcers.

On section the large nodules and many of the small ones showed caseo-calcareous centres ; a few of the smaller ones were caseous and softened, but not calcareous.

In the mucous membrane of the ileum, apart from that covering the Peyer's patches, were seen a few small yellow caseous foci.

The peritoneum covering the intestine was everywhere normal.

The Mesenteric Glands.—Were without exception enlarged ; on section they showed spherical caseo-calcareous nodules varying in size from one-tenth of an inch to three-quarters of an inch, the larger nodules being the most numerous , they were all situated in the centre of the glands and were surrounded by a definite fibrous capsule.

Cæcum, Colon, Rectum.—Normal.

Cæcal and Colic Glands.—A gland situated near the junction of the ileum and the cæcumwas enlarged (three inches) and contained numerous caseo-calcareous nodules ; there was also at one extremity a caseo-calcareous mass half an inch in diameter.

Two colic glands showed in the cortex small and large caseo-calcareous nodules ; a gland near the sigmoid flexure showed similar tubercles ; other glands along the large bowel were normal.

Parietal Pleura, Diaphragm.—Normal.

Lungs.—On the upper surface of both posterior lobes, along the interlobular septa, were numerous small villous tags ; with the exception of these the lungs were normal both on the surface and on section.

Pericardium and Endocardium.—Normal.

In the muscle wall at the apex of the right ventricle there was a large petechial hæmorrhage.

Thoracic Glands :

The Long Caudal Mediastinal contained two small yellow caseous nodules about one-tenth of an inch in diameter.

The smaller dorsal-mediastinal glands were unaffected. All the mediastinal glands were deeply congested.

Left Bronchial Gland.—In the left bronchial gland there were several nodules, similar to those in the long dorsal mediastinal, one of which projected very prominently on the surface.

Right Bronchial Glands.—(Two.) Contained two and three small caseous tubercles.

Liver.—On the upper surface of the right lobe were two nodules, one one-eighth of an inch in diameter, subcapsular, white on section ; the other one-sixth of an inch in diameter ; on section white, with caseous points.

On the surface of the right lobe there was a small white depressed cicatrix.

Liver substance normal on section.

Gall Bladder.—Normal.

Three Hepatic Lymphatic Glands contained each two or three caseous nodules one-tenth of an inch in diameter, one of which was calcareous.

Spleen.—Normal on surface and on section.

Kidneys.—Both right and left normal on surface and on section.

Suprarenal Capsules.—Normal.

Testicles.—Normal.

Various Lymphatic Glands :

Prescapular, Right.—Was enlarged, but showed on section only one area half an inch in diameter, congested, and with small tubercles. (The enlargement and congestion was caused by the tuberculin.)

Prescapular, Left ; Prepectoral, Right and Left ; Axillary, Right and Left ; Precrural ; Popliteal, Right and Left ; Gluteal, Right and Left ; Iliac, Right and Left ; Lumbar, Right and Left.—Normal.

Microscopic Examination (*Smear preparations*).

Cervical Gland.—No tubercle bacilli.

Bronchial Gland.—No tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli.

Emulsion (see below).—Tubercle bacilli.

Iliac Gland.—No tubercle bacilli.

Right Retro-Pharyngeal Gland and Submaxillary.—A few tubercle bacilli seen after prolonged search.

Intestine.—No tubercle bacilli.

Animals Inoculated.

Nodules were removed from six mesenteric glands and emulsified with 60 cc. of sterile salt solution; the emulsion was estimated to contain 133 tubercle bacilli per cubic cm.

The following bovines were inoculated subcutaneously with 10 cc. of this emulsion—Calf 114, Jersey Heifer 66, Shorthorn Heifer 100.

Guinea-pigs 393 (S.); 394 (I.); 395 (S.) were inoculated each with 1·0 cc. of the same emulsion.

The latter all died of general tuberculosis.

CALF 20.

Fed with Tuberculous Milk of Cow 18 (Virus B. II.) from May 25th, 1902, to June 28th, 1902, a period of 33 days.

Age at beginning of Experiment.—6 weeks.

Killed.—January 8th, 1903. 229 days after the experiment began.

Clinical History.

The calf was suckled by its foster-mother, Cow 18, from the day following her inoculation in the udder until her death. The calf showed no change in its general health during the experiment.

Tuberculin Tests.

June 24th, 1902, 30 days after the experiment began. Positive. Rise of temperature 1·0° C. There was a well marked œdematous swelling at the site of inoculation of the tuberculin; after several days the skin over the upper portion of the swelling sloughed and ulcerated.

August 12th, 1902, 99 days after the experiment began. Positive. Rise of temperature 1·4° C.

Weights.

The calf was not weighed at the beginning of the experiment; its weight at the end was 2 cwt. 3 qrs. 19 lbs.

Temperature.

There was some irregular pyrexia in the early part of the experiment, but during the rest of the experiment, with the exception of occasional slight rises, never beyond 40° C., the temperature remained practically normal.

POST-MORTEM EXAMINATION.

General condition of body good.

Mouth, Tongue, Pharynx, Tonsils.—Normal.

Retro-Pharyngeal Glands.—Measured $1\frac{3}{8}$ in. by $1\frac{1}{8}$ in.; on section they appeared perfectly normal.

Oesophagus.—Normal.

Stomachs.—Not examined internally.

Intestine.—Showed the following signs of tubercle:—In some of the Peyer's patches of the first part (duodenum) were a few hard yellowish spots beneath the mucous membrane. These were not at all conspicuous and were not larger than a pin's head. The middle part (jejunum) appeared perfectly sound; but in the ileum was more extensive tuberculosis. Several of the Peyer's (four or five) patches, about two or three feet from the ileo-cæcal valve, were thickened with little yellowish-white nodular deposits beneath the mucous membrane. The mucous membrane was quite intact over them, but a slight puckering suggested the previous existence of some ulceration. On the serous surface of these patches could be seen groups of little yellow tubercles as large as mustard seeds and rather prominent, under the peritoneum. A few little yellow foci were seen under the mucous membrane in the neighbourhood of the Peyer's patches.

The Large Intestine.—Was perfectly healthy throughout.

Mesenteric Glands.—Were slightly enlarged; all contained yellow calcareous and softened patches, and some of the glands were almost entirely calcareo-caseous.

Mesocolic Glands.—Appeared to be normal.

Liver.—Appeared perfectly healthy, except for one little hard spherical white mass of the size of a mustard seed, which readily shelled out.

Spleen.—Was quite unaltered.

Kidneys, Suprarenals.—Were normal.

Thorax:

> *Lungs.*—Normal, except for the right anterior lobe (near the anterior end), on the surface of which little pedunculated or sessile nodular masses could be seen following the lines of the interlobular septa; they were angular flattened and very loosely attached.
>
> On the contiguous part of the parietal pleura was a prominent ridge of confluent, or more or less confluent, prominent yellowish new growth. This followed the posterior edge of the first, both edges of the second, and the upper edge of the third rib, and was perhaps $\frac{1}{4}$ in. wide and $\frac{1}{2}$ in. in depth.
>
> *The Bronchial Glands.*—Appeared to be unaffected.

Guinea Pigs Inoculated Intraperitoneally.

No. 297 with an emulsion from one of the sessile growths from the lung became tuberculous.

No. 298 with an emulsion from the left bronchial gland became tuberculous.

No. 300 with an emulsion of a caseo-calcareous mesenteric gland became tuberculous.

No. 299 with an emulsion from the spleen remained healthy.

CALF 116.

Fed with Tuberculous Milk from Cow 68 (Virus B. III.) from June 18th, 1903, to August 4th, 1903.

Duration of Feeding—47 days.

Killed—September 18th, 1903. 92 days after the experiment began.

Clinical History.

The calf was suckled by its mother, Cow 68, for a period of 47 days, *i.e.*, from the day following the date of her inoculation (intramammary), June 18th, 1903, until her death, August 4th, 1903, and was afterwards fed on normal food for 45 days; the calf was 7 weeks old when the experiment began.

For the first 11 days the calf took all the infected milk, but for the remaining 36 days it got only that which was secreted during the day, all the morning milk from the infected quarters being used to feed Monkeys 64 and 66.

The day after the experiment began the calf appeared to be a little seedy and had a slight attack of diarrhœa;

it remained unwell looking for about a week and then got better; during the rest of the experiment there were no signs of ill-health.

Weight.

During the first week of the experiment the weight was stationary; subsequently there was a steady progressive increase.

	cwt.	qrs.	lbs.
June 16th, 1903 - - - -	1	0	7
June 23rd, 1903 - - - -	1	0	7
September 15th, 1903 - -	1	2	7
Gain in weight - -	0	2	0
Average weekly increase -	0	0	4·27

Temperature.

The temperature during the first week was slightly raised; it was subsequently normal, except in the second week of August, when there was some slight irregular pyrexia (max. 39·7° C.).

Tuberculin Tests.

July 29th, 1903. 41 days after the experiment began. Positive rise of temperature, 1·6° C.

September 11th, 1903. 85 days after the experiment began. Positive rise of temperature, 1·6° C.

POST-MORTEM EXAMINATION.

Condition.—Moderate amount of fat everywhere present.

Tongue, Tonsils, Naso-pharynx.—Normal.

On the posterior surface of the uvula, just above the epiglottis, there was a series of minute punctiform hæmorrhages.

Submaxillary Glands, Retro-Pharyngeal Glands, Œsophagus.—Normal.

Abdomen :

Omentum, Peritoneum.—Normal.

Small Intestine.—The mucous membrane of the upper 30 feet or so of the small intestine was congested. In a Peyer's patch 35 feet from the pylorus there was a small ulcerated caseo-calcareous area from which calcareous particles projected into the lumen of the gut. Ten feet lower down a Peyer's patch contained four yellow caseous foci, not definitely circumscribed; two of these foci were calcareous.

The long terminal Peyer's patch was congested in patches; at its upper end, between the lymphoid tissue and the muscle wall, there was a caseating shotty tubercle. A smaller one, grey and translucent on section, occurred a little lower down; each caused a projection on the peritoneal surface.

At the margin of the long Peyer's patch, near its upper end, there were two submucous tubercles the size of a wheat grain; one was caseous, but not softened; the other was gritty from calcification.

The mucous membrane over all the latter tubercles was intact.

Large Intestine.—Normal.

Gastric Glands.—Normal.

Mesenteric Glands.—For the most part the mesenteric glands were not appreciably enlarged; two, however, at the upper end and one about the middle of the mesentery had nodular enlargements from ¾ in. to 1 in. in diameter. Besides these three, nine or so showed projecting caseous nodules, the size of large peas. All the nodules on section were entirely calcareous.

A few other glands show minute and scattered calcareous grains.

Not more than twelve to fifteen glands (about one-third of the total number) were affected, the majority of the affected glands being in the upper part of the mesentery.

The glands around the pancreas and along the large intestine were normal.

Spleen.—11 ozs. Normal on surface and on section.

Liver.—3 lbs. 11 ozs. On the anterior surface, 1¾ in. from the inferior margin of the middle lobe, just beneath the capsule, there was a small grey tubercle, yellow in the centre, about the size of a mustard seed.

Hepatic Lymphatic Glands, Kidneys (each weighed 6 ozs.), *Suprarenal Bodies.*—Normal.

Thorax :

Heart.—Normal.

Pleura and Diaphragm.—Normal.

Lungs.—On the external surface of the right posterior lobe, close to the inferior margin, there was a shot-sized tubercle, surrounded by a zone of congestion. It was caseous in the centre, but not softened or appreciably calcified.

Elsewhere the lungs were normal.

Thoracic Glands.—In the cortex of the long dorsal mediastinal gland there were two congested patches, each one-eighth of an inch in diameter; there was no naked eye evidence of tuberculosis.

Three other mediastinal glands and the bronchial glands were not enlarged nor obviously tuberculous.

Mammary Glands, Uterus and Ovaries.—Normal.

Other Lymphatic Glands :—

Cervical, Right and Left ; Prescapular, Right and Left ; Prepectoral, Right and Left ; Axillary, Right and Left ; Lumbar, Right and Left ; Iliac, Right and Left ; Precrural, Right and Left ; Popliteal, Right and Left ; Gluteal, Right and Left ; Ischiatic, Right and Left ; Supramammary, Right and Left.—Normal.

Microscopic Examination. (*Smear Preparations.*)

Tubercle in Liver.—No tubercle bacilli.

Tubercle in Lung.—No tubercle bacilli.

A Thickly Spread Smear from Emulsion of Mesenteric Glands.—Showed a few tubercle bacilli.

An emulsion, amounting after filtration to 15 cc., was prepared from all the mesenteric gland nodules (save those in two glands which were reserved for cultures and sections). A sample of the emulsion was sent to Dr. Eastwood, who reported that in a measured film (0·005 cc.) no tubercle bacilli were found. On account of this poverty in bacilli, the emulsion was not used to inoculate calves.

Animals Inoculated.

Four guinea-pigs inoculated each with 0·5 cc. of the mesenteric gland emulsion, died of tuberculosis.

A guinea-pig inoculated with an emulsion from the spleen died in three days of an acute infection.

Rabbit 6, inoculated subcutaneously with 10 cc. of the mesenteric gland emulsion, died in 10 days of an acute infection.

CALF 86.

Suckled by its Foster-mother Cow 74 for 190 days.

The Experiment began on January 7th, 1903, 8 days after the cow was inoculated, and ended on July 16th, 1903. The calf was 8½ weeks old.

Killed—July 16th, 1903. 190 days after the experiment began.

Clinical History.

During the first month of the experiment the calf had diarrhœa, probably on account of the change in its diet; it recovered from this and during the rest of the experiment showed no symptom of illness.

Tuberculin Tests.

June 11th, 1903, 155 days after the experiment began. Positive. Rise of temperature 1·5° C.

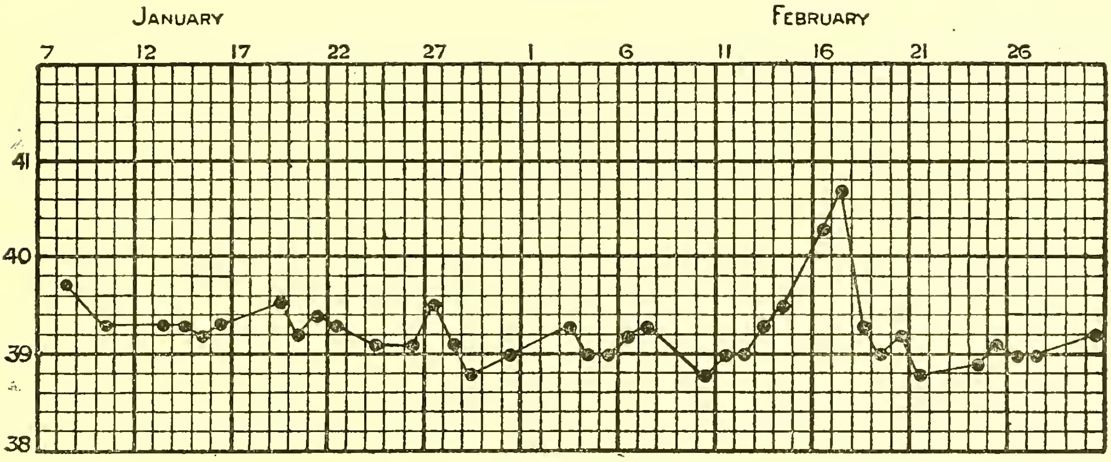
July 8th, 1903, 182 days after the experiment began Positive. Rise of temperature 1·4° C.

Weights.

There was a steady increase in weight.

	cwts.	qrs.	lbs.
January 20th 1903 - - -	1	2	0
July 14, 1903 - - - -	3	0	14
Gain in Weight - - - -	1	2	14
Rate of gain per week - - -	0	0	6·7

Temperature.



During the remaining period of the experiment the temperature was normal.

POST-MORTEM EXAMINATION.

General Condition.—Exceedingly good. Large amount of fat in omentum and round kidneys.

Right Tonsil, Left Tonsil.—Somewhat pigmented in centre. No tubercle.

Right Retro-Pharyngeal Gland, Left Retro-Pharyngeal Gland.—Size of walnuts; no tubercle.

One Tracheal Gland the size of a broad bean, with distinct fibrous capsule, was caseous, with calcareous deposits throughout the whole substance.

Œsophageal Glands.—Normal.

Between the stomach and the diaphragm, near the œsophageal opening, was a small gland, the size of a French bean, which was simply a capsule containing yellow caseous material.

A small group of glands between stomach and diaphragm was normal.

Gastric Glands.—Three groups of gastric glands between the several stomachs, all normal.

A gland near pylorus contained a large quantity of fluid. No tubercle.

The glands over the fourth stomach were normal.

Small Intestine.—About 30 feet from the pylorus, a Peyer's patch contained a pea-sized nodule, which on section had the same colour as the lymphoid tissue in which it was embedded and showed two tiny yellow caseous points in the centre. The mucous membrane was intact over it.

About 34 feet from the pylorus there was in a Peyer's patch a crateriform ulcer, with rounded overhanging edges and caseo-calcareous floor. In the same patch there were two pinhead-sized calcareous points.

About 54 feet from the pylorus was a small yellow projecting focus of caseous material.

The intestine elsewhere was normal.

Colon and Rectum.—Normal.

Mesenteric Glands.—The first three series of glands at pyloric end were normal. Then a small gland the size of a filbert, caseous and calcareous for about half its extent. There was a small caseous point in the longest gland of the group, near the anterior end. A further caseous and calcareous pinhead point was seen in a gland just in front of the long gland. In the group of glands near the ileo-cæcal junction there was distinct caseation and calcification; the glands were hard and enlarged and on section entirely caseo-calcareous. (Kept for inoculation.) The total number of mesenteric glands affected was five. There were petechial hæmorrhages in all the glands, as in the hepatic gland, but not so marked.

All the glands along the large intestine were normal.

Pleura, Heart, Lungs.—Normal.

Bronchial and Mediastinal Glands.—Very small; no trace of tubercle.

Omentum.—Contained a considerable amount of fat. No evidence of tubercle.

Liver.—On the anterior margin of liver, one inch behind gall-bladder, were a couple of nodules, caseous and calcareous; organ otherwise normal.

There were small petechial hæmorrhages in the cortex of the gland at the hilum of the liver.

Spleen.—Some thickening on upper surface. No tubercle on naked eye examination.

Kidneys.—On the surface of the right kidney was a series of pale patches about the size of millet seeds. On section it was found that these extended into the cortex for some distance. They were more or less wedge-shaped, light grey in colour, had no congested zone around them and appeared to be groups of altered tubules—not tubercles. One of these little areas was considerably depressed below surface of kidney.

The left kidney was in a similar condition.

Left Suprarenal, Right Suprarenal.—Very tough; deeply injected outer zone; pale medulla; no tubercle.

Mammary Gland.—Very small. The bulk of the tissue resembled adipose tissue very closely. The small masses of glandular tissue were near the teats, and about an inch in diameter.

Uterus and Fallopian Tubes.—Normal.

Various Lymphatic Glands :

Prescapular, Right and Left; Axillary, Right and Left; Prepectoral, Right and Left; Popliteal, Right and Left; Inguinal, Right and Left.—Normal.

Iliac, Right and Left; Lumbar, Right and Left; Gluteal, Right and Left; Ischiatic, Right and Left; Precrural, Left.—Normal.

Microscopic Examination.

In the smear preparation from the emulsion used to inoculate guinea-pigs, two tubercle bacilli were found.

No tubercle bacilli were found in a smear and sections made from a tubercle in the liver, nor in a film from the submucous nodule in the intestine.

A section of the wedge-shaped area in the kidney showed altered tubules, increase of connective tissue and a round-cell infiltration (infarction ?). There were no giant cells, necrotic areas or tubercle bacilli.

Guinea-pigs Inoculated.

Four guinea-pigs were inoculated, two subcutaneously and two intraperitoneally, with an emulsion from the mesenteric glands. All died of general tuberculosis, the former in 59 and 47 days, the latter in 33 and 37 days respectively.

A guinea-pig inoculated with an emulsion from the spleen and one with an emulsion from the thigh muscles remained healthy.

CALF 38.

Suckled by its Mother Cow 40 (Virus B. I. Table 1 A) from October 18th until December 31st,1902, a period of 74 days. The calf was tied up apart from its mother and was allowed to suck only twice a day immediately after the two inoculated quarters had been milked for Pigs 6 and 8; the amount of tuberculous milk ingested by this animal therefore must have been very small.

The age of the Calf at the beginning of the experiment was 5 months.

Killed—December 31st, 1902. 74 days after the experiment began.

Clinical History.

There were no signs of illness during the experiment and the temperature remained normal throughout. The weight at death was 3 cwt. 1 qr. 22 lbs. (the only record). The calf was not tested with tuberculin during the experiment.

POST-MORTEM EXAMINATION.

General Condition.—Fairly good.

Tonsils.—Normal.

Pharyngeal Glands.—Normal.

Abdomen :

Omentum.—Normal.

Intestines.—An elongated Peyer's patch, 45 feet from the pylorus, showed three small ulcers. In other parts there was a little congestion but no sign of tuberculosis.

Mesenteric Glands.—Several presented caseating foci; two in the posterior part of the mesentery were caseating and calcareous.

Liver.—Normal.

Portal Glands.—Normal.

Spleen.—Normal.

Kidneys.—Normal.

Iliac Glands.—Normal.

Thorax :

Heart, Pleura, Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Udder.—Normal.

Precrural Glands, Popliteal Glands, Prepectoral Glands, Axillary Glands.—Normal.

Microscopic Examination.

Emulsion of Mesenteric Glands.—Tubercle bacilli moderately numerous.

Guinea-Pigs Inoculated.

No. 284, inoculated intraperitoneally, and No. 285, inoculated subcutaneously with an emulsion made from the mesenteric glands, died of general tuberculosis in 62 days and 104 days respectively.

PIGS 2 and 4.

These two pigs were fed from June 7th, 1902, until June 28th, 1902, with milk obtained from three cows, Nos. 500, 4 and 18; the milk of Cow 500 was used from June 7th to June 18th, and that from Cows 4 and 18 from June 14th until the death of these animals on June 20th and June 28th respectively.

The secretion from the inoculated quarters of the cows was yellow and serous and more abundant than that from the normal quarters.

The quantity of milk available for the two pigs up to June 20th amounted to about 1 pint night and morning; after June 20th they got only about ¾ pint a day.

PIG 2.

Fed with Tuberculous Milk from June 7th, 1902, to June 28th, 1902. (21 days.)

Age at the beginning of the Experiment—About 7 weeks.

Killed—November 14th, 1902. 160 days after the experiment began.

Clinical History.

The pig showed no sign of illness during the experiment, but did not grow quite so fast as its fellow, No. 4, and when killed was distinctly smaller.

Tuberculin Test.

August 2nd, 1902, 56 days after the experiment began. Positive. Rise of temperature, 1·8°C.

POST-MORTEM EXAMINATION.

General Condition.—This pig had not grown quite as fast as its fellow and was distinctly smaller. The body was fat. Under the jaw a prominent fluctuating swelling as large as a hen's egg was felt.

Tongue.—Normal.

Tonsils.—The mucous membrane seemed a little thickened and corrugated (compared with a pig killed at Blythwood November 12th), but was not ulcerated. On the left side, however, immediately below the mucous membrane there was some softened caseous material.

Submaxillary Glands.—Under the jaw near the middle line were two entirely softened glands as large as hen's eggs, containing greenish pus.

Other caseous glands existed in the submaxillary region near the anterior end of the sternum and dorsal to the great vessels.

The Submaxillary Salivary Gland on one side contained numerous little tubercles.

Thymus.—Normal.

Abdomen :

Peritoneum.—On the surface of the colon were fairly numerous prominent subperitoneal tubercles, up to the size of a pea.

There were three or four similar tubercles on the lower surface of the diaphragm.

Omentum.—Contained a few smaller tubercles only.

In the parietal peritoneum were none.

Mesentery.—Was full of little pea-sized caseous tubercles.

The upper third of the œsophagus contained numerous little hard whitish foci.

Stomach.—Normal.

Small Intestine.—Just beyond the pylorus the mucous membrane was thickened and corrugated and superficially ulcerated for an inch or two. Beyond this till more than half-way the intestine was normal. Then in the Peyer's patches a few little prominent congested foci were seen, and these got a little larger lower down and some of them were ulcerated. The last few feet showed none of these changes, but the terminal 18 in. was congested.

The ulcers and tuberculous foci were small and had to be carefully looked for.

Large Intestine.—Showed numerous little prominences with central depressions (minute ulcers with thickened margins ?), and one prominent caseous mass as large as a pea beneath the mucous membrane.

Mesenteric Glands.—Were all greatly enlarged and caseous, they formed a mass larger than one's two fists, and together weighed 20 ozs., when partially freed from mesentery and fat.

Spleen.—Was probably not enlarged ; it contained at its upper end about half a dozen spherical softened tuberculous masses as large as marbles.

Liver.—Contained innumerable whitish tubercles of all sizes up to that of a small pea, caseating. The liver tissue appeared otherwise normal. The glands in the portal fissure were as large as pigeons' eggs and formed a mass as big as an orange.

Kidneys and Suprarenal Bodies.—Normal.

Uterus, Ovaries and Pancreas.—Normal.

Thorax :

Pleura.—On the right side only, at the head of each rib (from No. 2 to 8), was a prominent caseous tubercle as large as a bean. At the junction of these ribs with their cartilages also was a row of rather smaller tubercles, while others were scattered between in these and the more posterior spaces.

Lungs.—Contained a large number of grey nodules up to the size of a pea, some of these were beginning to caseate and were yellowish white in the centre.

Bronchial Glands.—Formed a bunch as large as a small orange and weighed together 2 ozs. ; they were entirely softened and some were as large as a pigeon's egg.

Microscopical Examination. (Smear Preparations.)

Tubercle bacilli were found in smears made from a bronchial gland and the lung ; none were found in smears from the intestine, spleen and liver.

Guinea Pigs Inoculated.

No. 234, with emulsion of nodule from costal pleura, died of general tuberculosis.

No. 235, with emulsion of liver, died of general tuberculosis.

No. 236, with emulsion of bronchial gland, died of general tuberculosis.

No. 237, with an emulsion of kidney, died in two days of an acute infection.

PIG 4

Fed with Tuberculous Milk from June 7th, 1902, to June 28th, 1902 (21 days).

Age at the beginning of the Experiment—About 7 weeks.

Killed—February 26th, 1903. 264 days after the experiment began.

Clinical History.

The pig remained in good health during the experiment and became very fat ; weight at death 1 cwt. 2 qrs. 6 lbs.

Tuberculin Test.

August 2nd, 1902, Fifty-six days after experiment began. Positive. Rise of temperature 1·3 ° C.

POST-MORTEM EXAMINATION.

The body was extremely well nourished.

Alimentary Canal.

Tongue and Buccal Mucous Membrane.—Normal.

Pharyngeal Lymphatic Tissue.—Normal ; no enlargement of the retro-pharyngeal glands.

Submaxillary Salivary Glands.—Healthy.

Submaxillary Glands.—Two or more on each side—one the size of a pigeon's egg—all softened and caseous.

Two soft and caseous glands, the size of a small marble, were seen in the parotid region ; also one small one on the left hyoid bone.

Stomach.—On the peritoneal surface were two prominent nodules about the size of peas, containing soft caseous material. The mucous membrane was normal.

Posterior to the stomach was a large mass of lymphatic glands, entirely caseous and softened ; the mass formed a lump about the size of a cricket ball and appeared to be composed of portal and coeliac glands fused together.

Intestines.—In the duodenum and in the early part of the ileum a few Peyer's patches were slightly swollen ; in the midst of the lymphoid tissue of one or two Peyer's patches were seen several greyish-yellow points, each about the size of small pin-heads ; these Peyer's patches showed areas of congestion chiefly surrounding the collections of yellow points.

Throughout the whole length of the large intestine on its mucous surface were numbers of small slightly raised greyish follicles, with central dark depressed umbilications (? normal). (*See* Pig 2.) On the peritoneal surface of the large intestine (cæcum) was seen a small prominent tuberculous nodule.

In the recto-vesical fold there was a pea-sized softened nodule. On the posterior surface of the rectum, lying loosely beneath the peritoneum, a number of small pea-sized softened glands were seen.

The Mesenteric Glands.—Were greatly enlarged ; the mass with the fat in which they were embedded weighed 1 lb. 14 ozs. ; many of the glands were as large as a thrush's egg ; they were all entirely softened and caseous.

Meso-Colic Glands.—Without exception, enlarged (up to the size of a pigeon's egg) and entirely softened.

There was a gland (the size of a walnut), soft and caseous, in the mesentery at the pyloric end of the stomach.

Abdomen.

Liver.—2 lbs. 6 ozs., everywhere beset with whitish softened tubercles varying in size from a small to a large pea, *Spleen.*—4 ozs. On the surface were three prominent rounded tubercles, the size of large peas; in the splenic tissue were a few small greyish necrotic but not softened areas.

An Iliac Gland, on the right side, was slightly enlarged reddened and mottled, and contained a small caseous focus.

Thorax.

Diaphragm.—The diaphragm presented a number (about thirty) of rounded nodules, about the size of large peas; these nodules projected much more prominently on the pleural surface than on the peritoneal surface; five of them were surrounded by soft pinkish vascular vegetations; all the nodules were filled with soft caseous material.

Pleura.—The costal pleura was perfectly healthy.

The Lungs contained numerous small tubercles and groups of tubercles, varying from the size of a mustard seed to that of a small pea; these were all caseating but not softened.

The Bronchial Glands formed three nodular masses, measuring 2 in., 1 in., and $\frac{3}{4}$ in. in length respectively; these were caseous and soft, like the mesenteric glands.

Near the head of the right fifth rib was a swelling. the size of a hen's egg, composed of a thin outer shell of bone enclosing soft caseous material.

An enlarged and caseous gland was found close to the right hip joint, between the joint and the obturator foramen.

All the organs, with the exception of those parts affected with tubercle, appeared to be perfectly normal.

Microscopical Examination.

Films were made from the pus from a mesenteric and a bronchial gland, and from the liver and spleen. Tubercle bacilli were found in the pus from the mesenteric gland. Bacilli were not found in the films made from the bronchial gland, liver, and spleen.

Guinea-pigs.

Guinea-pigs 319, 320, 321, and 322 were inoculated intraperitoneally with emulsions made from the liver, spleen, mesenteric and bronchial glands respectively; all died of general tuberculosis.

PIGS 6 and 8.

These two pigs were fed with milk of Cow 40 from October 1st, 1902, to December 31st, 1902. Cow 40 was inoculated in the udder, on September 30th, 1902, with an emulsion of a culture obtained from Guinea-pig 14, inoculated with the original material of Virus B1. From October 1st, 1902, to October 18th, 1902, the two pigs were given all the milk yielded by the cow. On October 18th, 1902, Calf 38 was restored to its mother, and the two inoculated quarters alone were milked twice a day for the pigs. At first the quantity of milk available for the two animals was about two quarts per diem; after about two months it became reduced to about one pint a day; this represented milk from all four quarters, the greater part coming, doubtless, from the uninoculated ones.

Both pigs throve exceedingly and grew very fat; they became much larger than other pigs of the same litter, which received no milk but only meal.

E. G.—Weights on December 10th, 1902.

	qrs.	lbs.
No. 6	5	16
No. 8	5	8
Two normal pigs (*a*)	4	5
(*b*)	3	10

PIG 6.

Age—About 6 months.

Fed with Milk of Cow 40 from October 1st, 1902, to December 31st, 1902.

Duration of Feeding—92 days.

The pig was not weighed at the beginning of or during the experiment; the weight at death, after 20 hours' fasting, was 5 qrs. 26 lbs.

Killed—January 7th, 1903. 99 days after the experiment began.

POST-MORTEM EXAMINATION.

The body was in splendid condition; very fat.

Mouth, Pharynx.—Healthy.

Tonsils, Lymphatic Tissue of Palate.—Were perfectly normal.

Larynx, Oesophagus.—Perfectly normal.

Left Submaxillary Lymphatic Gland.—Was enlarged and consisted of dense fibrous tissue enclosing little collections of yellow caseous material.

Right Submaxillary Lymphatic Gland.—Normal.

Stomach, Small and Large Intestine.—Showed no trace of tubercle anywhere. The Peyer's patches were perfectly healthy.

On the other hand the lymphatic glands connected with the alimentary canal were—many of them—tuberculous.

Mesenteric Glands.—Among the mesenteric glands were about half a dozen, as large as small marbles, entirely caseous, and others showing caseating foci.

The Liver contained perhaps a dozen little hard white tubercles little larger than a pin's head.

Portal Glands.—In the lesser omentum, near the pylorus and contiguous to the common bile duct, were darkly coloured lymphatic glands containing caseating foci beginning to soften.

The Spleen contained three or four tubercles similar to those in the liver.

Pancreas, Kidneys, Suprarenals, Thyroid, Uterus, Ovaries.—Normal.

Thorax:

The Lungs more particularly the left, were found to contain a good many little tubercles about as big as pins' heads, white and hard, so that they could be more readily felt than seen.

Bronchial Glands.—The left measured about $1\frac{1}{2}$ in. in its longest diameter, and was dense and fibrous, containing numerous little cavities filled with yellow caseous material.

The right was similar, though smaller.

Microscopical Examination. (*Smear Preparations.*)

Emulsion of Tubercle from Liver.—No tubercle bacilli seen.

Emulsion of Tubercle from Spleen.—No tubercle bacilli seen.

Emulsion of Caseous Bronchial Gland.—Tubercle bacilli very few.

Emulsion of Caseous Mesenteric Gland.—Tubercle bacilli very few.

Guinea Pigs Inoculated.—All subcutaneously.

No. 293, with emulsion of liver, died of general tuberculosis 127 days after.

No. 294, with emulsion of spleen, died of general tuberculosis 103 days after.

No. 295, with emulsion of bronchial gland, died of general tuberculosis 75 days after.

No. 296, with emulsion of mesenteric gland, died of general tuberculosis 75 days after.

PIG 8.

Age—About 6 months.

Fed with Milk of Cow 40 from October 1st, 1902, to December 31st, 1902.

Duration of Feeding—92 days.

Killed—June 4th, 1903.

Total Duration of Experiment—247 days.

Tuberculin Test.

May 14th, 1903. Positive. The temperature rose 1·9° C.

Weights.

	cwts.	qrs.	lbs.
December 10th, 1902 (70 days after the experiment began) - - -	1	1	8
June 2nd, 1903 - - -	2	1	7
Gain in weight - - -		3	27
Rate of gain per week -			3·15

POST-MORTEM EXAMINATION.

General Condition.—The carcass was fat and in very good condition.

Tongue, Pharynx, Left Tonsil.—Normal.

In the substance of the right tonsil there was a small focus of yellow cheesy material, which easily shelled out. (Secretion in tonsillar crypt.)

Larynx, Œsophagus, Submaxillary Glands, Retro-Pharyngeal Glands.—Normal.

Small Intestine.—About the centre of the jejunum, at the base of a Peyer's patch, and seen through the peritoneum, was a yellow caseous nodule about the size of a small pea; the mucous membrane over it was intact. In the same Peyer's patch there was also a small grey pinhead sized tubercle.

About 7 feet from the ileo-cæcal valve was a small congested nodule about the size of a splitpea; no ulceration.

Large Intestine.—Normal.

Lymphatic Glands in Connection with the Alimentary Canal.—Along the line of the pancreas and the lesser curve of the stomach was a series of tuberculous glands. They ran along the anterior margin of the pancreas, were very deep red in colour, except where tuberculous, when they were yellowish grey.

Ileo-colic Glands.—Just at the junction of the small and large intestines was a series of glands, firm, nodulated, with yellow points, about fifteen in all, each about the size of a broad bean.

One of the glands opened was found to contain soft caseous material in little round particles. The whole of the glands in this group were found to be in a similar condition when opened. There was very little calcareous material.

Thorax:

Heart and Pericardium.—Normal.

Lungs.—There were three caseous tubercles, the size of a millet seed, in the lung, one of which was calcareous.

Right Bronchial Glands.—(Two). One contained two caseous tubercles, a large calcareous one, the size of a small pea, and a small one the size of a pinhead; the other contained one small caseous tubercle.

A Left Bronchial Gland contained a small caseous tubercle.

The Long Dorsal Mediastinal Gland contained four yellow softened and caseous tubercles about the size of barley grains.

The Ventral Mediastinal Glands were normal.

A gland at the bifurcation of the trachea contained a caseous nodule, similar to those in the dorsal mediastinal gland.

Pleura and Diaphragm.—Normal.

Abdomen:

Spleen—Normal to naked eye, and on section.

Pancreas.—Apparently perfectly normal.

There was a tuberculous gland, 1 in. by ½ in., near head of pancreas.

Liver.—There were about six minute grey points on the surface of liver; all the nodules in the liver were quite superficial.

Hepatic Lymphatic Glands, Kidneys and Suprarenals.—Normal.

Various Lymphatic Glands:

Cervical Glands, Prescapular Glands, Superficial and Deep Inguinal Glands, Iliac Glands, Lumbar Glands.—Normal.

Microscopical Examination. (*Smear Preparations.*)

Mediastinal Gland.—No tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli.

Cervical Gland.—No tubercle bacilli.

Emulsion of Mesenteric Gland and Gland near Pancreas.—No tubercle bacilli.

Liver.—No tubercle bacilli.

Intestine.—No tubercle bacilli.

Lung.—No tubercle bacilli.

Tonsil.—No tubercle bacilli.

Animals Inoculated.

An emulsion was prepared from some of the mesenteric glands and a pancreatic gland.

With this emulsion Calves 104 and 106 and Pigs 10 and 12 were inoculated subcutaneously, each with 10 cubic centimetres.

Guinea-pigs 425 and 426 were inoculated subcutaneously, and Guinea-pig 427 was inoculated intraperitoneally, each with 1 cc. of the same emulsion.

Guinea-pig 428 was inoculated intraperitoneally with an emulsion from the spleen and Guinea-pig 429 was inoculated intraperitoneally with an emulsion from the liver.

The guinea-pig inoculated with the spleen emulsion was killed after 95 days and found to be free from tuberculosis.

The other guinea-pigs died of tuberculosis in periods varying from 35 to 95 days.

PIG 92.

Fed once with Tuberculous Milk of Cow 172 (Virus B. IV.).

Volume of Milk—107 cubic centimetres.

Number of Tubercle Bacilli—10 million.

Date—October 28th, 1904.

Age—8 weeks.

Killed—When dying, March 14th, 1904. 137 days after feeding.

Clinical History.

The pig was first noticed to be seedy about the end of January. It then became progressively thinner and weaker and lost appetite. In the last few weeks of life the respirations were greatly increased. The temperature during the experiment was irregular, but never rose beyond 39·9°C.

Weight.

There was a steady increase in weight, week by week, up to January 17th; subsequently the weight steadily declined; the final weighing showed an increase of 3 lbs. on the initial weight.

	qrs.	lbs.
November 1st, 1904 - - - -	1	2
January 17th, 1904 - - - -	1	23
March 14th, 1904 - - - - -	1	5
Gain in weight - - - - -	0	3

POST-MORTEM EXAMINATION.

Carcass.—Very emaciated.

Tonsils.—The left showed an irregular, quiescent ulcer 1 cm. in diameter, at the base of which, in the subtonsillar tissue, there was a caseous gritty nodule 3 mm. in diameter.

On the surface of the right tonsil there were four small scars; on section nodules were seen in the subtonsillar tissue similar to that in the left tonsil.

Pharyngeal Mucous Membrane.—Normal.

Submaxillary Glands.—The right were enlarged and fused together to form a mass measuring 2 in. by 2 in. by 1 in.; on section the glands were composed throughout of dense yellow brittle caseated tissue, appreciably gritty from calcification; the freshly cut surfaces of the glands had a rosy tint.

On the left side there was a slightly smaller mass of glands; these resembled those on the right side, but one of the glands in the centre was softened.

Cervical Glands.—On the right side of the neck, extending from the articulation of the jaw to the peak of the shoulder there was a chain of six or seven glands ranging in size from a broad bean to a filbert; these on section were indurated caseating and gritty, those near the jaw being more affected than those near the shoulder.

On the left side of the neck there was a similar chain of glands, but these were not so far advanced in caseation as those on the right side.

Retro-Pharyngeal Glands.—The right was slightly enlarged and contained three caseating nodules, the largest the size of a pea, the smallest that of a pin's head.

The left contained one caseating tubercle.

Abdomen :

Omentum.—Appeared normal.

The Parietal Peritoneum near the spleen presented a few short connective tissue processes.

On the serous surface of the large intestine there were numerous grey granules, and between the coils there were scattered some yellow nodules the size of barley grains.

Small Intestine.—Normal.

Large Intestine.—The mucous membrane of the large intestine was normal.

Mesenteric Glands.—Were not enlarged; they showed altogether from twelve to fourteen widely distributed cheesy nodules, the largest the size of a wheat grain.

Colic Glands.—Normal.

The Spleen was enlarged; projecting on both surfaces were numerous large rounded yellow nodules, some of which were 1·5 cm. in diameter. The capsule of the spleen between the nodules was thickened in patches. On section of the spleen the substance was found to be packed with nodules of various sizes; they were firm opaque yellow in the centre (a few were gritty), red and congested-looking around the margins.

The Liver was roughened on the surface in contact with the diaphragm; the substance contained a considerable number of discrete tubercles ranging in size from a pin's head to a wheat grain; the tubercles had caseous, sometimes highly [calcareous centres and fibrous capsules; in the centre of the liver many of the tubercles were deeply bile-stained: on close inspection the liver substance was seen to be speckled with extremely minute grey foci.

The Portal Glands were much enlarged; on section they showed large opaque yellowish-white slightly gritty caseous areas, surrounded by a small amount of translucent fibroid tissue.

The Cœliac Glands were similarly affected.

The Kidneys showed on the surface numerous spherical grey tubercles, mostly about the size of pin's heads; a few tubercles were seen in the depth of the cortex, none in the medullary zones.

Suprarenal Bodies.—Normal.

Thorax :

Heart and Pericardium.—Normal.

Larynx and Trachea.—Normal.

The Lungs were semi-solid; externally they had a grey, translucent appearance; on section the lung tissue was diffusely infiltrated with grey tissue which in many places appeared to occupy almost the whole of a lobule. In the centres of some of the lobules were pea-sized caseous nodules with gritty centres. Pieces of the lung cut from any part just floated in water.

The fringes around the margins of the lungs were hypertrophied, and here and there contained small tubercles; on the surface of the lung there were numerous processes of connective tissue.

The Bronchial Glands were considerably enlarged; on section they were dense fibroid and extensively replaced by large firm irregular caseous areas, slightly gritty from calcification.

The Tracheal Gland was practically caseous throughout.

The Ventral Mediastinal Glands were slightly enlarged and showed opaque slightly gritty caseous areas.

On the Parietal Pleura there were numerous slender connective tissue processes, at the base of some of which little hard bodies could be felt; there were also a few scattered hard nodules; on the left side anteriorly there were some small subpleural caseating growths.

Diaphragm.—The diaphragm showed on both surfaces of the tendon, but particularly on the peritoneal surface on the right side, numerous hard translucent nodules of various sizes; on the peritoneal surface on the right side the nodules occurred also on the muscle —the larger nodules were yellow and gritty in the centre.

Prescapular Glands.—Normal.

One of the right superficial inguinal glands was enlarged and indurated; on section there was in the centre a firm caseous gritty mass, and around the margins caseous streaks. One of the left inguinal glands showed a few caseous foci. Right precrural gland normal.

Left Precrural Gland.—Showed at one extremity early caseation in the cortex.

Prepectoral Glands.—Contained caseating tubercles.

Uterus and Fallopian Tubes.—Normal.

Microscopical Examination. (*Smear Preparations.*)

Right Tonsil.—A few tubercle bacilli.

Right Precrural Gland.—No tubercle bacilli.

Right Submaxillary Gland.—A few tubercle bacilli.

Cultures were sown from the right submaxillary gland; twenty-four hours later all the tubes showed a pure culture of streptococcus.

PIG 122.

Fed with Milk of Cow 300* from September 16th, 1905, to September 23rd, 1905 (8 days).

Age—6½ weeks.

Killed—December 7th, 1905. 82 days after the experiment began.

POST-MORTEM EXAMINATION.

Organs and glands perfectly normal in appearance.

PIG 128.

Fed with Milk of Cow 300* from September 23rd, 1905, to September 30th, 1905.

Age—7½ weeks.

Killed—December 8th, 1905. 75 days after the experiment began.

POST-MORTEM EXAMINATION.

There was no sign of tuberculosis in any of the organs or glands.

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* Cow 300 was inoculated subcutaneously with 100 milligrammes of culture derived from the original material of Virus B. VI., through the Guinea-pig.

PIG 152.

Age—9 weeks.

Fed—Once with culture obtained from the original material of Virus B. XXVIII. (The culture used was the 6th generation, 21 days old.)

Date—June 1st, 1906.

Dose—10 milligrammes.

Killed—September 13th, 1906.

Duration of Experiment—104 days.

Clinical History.

The animal showed no signs of ill-health during the experiment.

The temperature from June 18th to July 14th was irregular and usually slightly raised (maximum 40·3°C); subsequently it was practically normal.

Weights.

	qrs.	lbs.
June 5th, 1906 - - - - -	1	12
September 13th, 1906 - - -	2	25

Gain in weight.—1 qr. 13 lbs.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Tonsils.—The surface of each tonsil was irregularly eroded and scarred, the right more than the left; the right showed on section in the substance discrete yellow foci, and in the subtonsillar tissue three or four caseous nodules up to a hemp-seed; in the substance of the left tonsil there were two small collections of yellow purulent material.

Tongue.—Under the mucous membrane on the right side near the base there were three or four hemp-seed-sized caseous nodules.

On the right side of the epiglottis near its root there was a submucous caseous nodule the size of a hemp-seed.

Submaxillary Glands.—On the right side near the angle of the jaw there was a gland the size of a goose's egg. which on section was caseous throughout and partially softened. On the left side there was a slightly larger gland, which on section was found to be a thin-walled cyst containing light brownish foul-smelling pus and some firm caseous masses; a small indurated gland attached to the capsule showed some small cavities filled with caseo-pus.

Cervical Glands.—On the right side near the articulation of the jaw there was an elongated gland $1\frac{3}{4}$ in. in length, composed partly of dense gritty caseous substance and partly of fibroid glandular tissue beset with caseous nodules up to a hemp-seed in size; a gland the size of a broad bean near the latter was similarly affected.

In a corresponding position on the left side there were two glands which were a little firm but not otherwise abnormal.

In the middle of the neck on the right side there was a group of five enlarged glands, the largest the size of a thrush's egg; on section the latter was practically caseous throughout; three of the others were partly composed of softening caseous material and partly of indurated glandular tissue containing caseous tubercles; the fifth was indurated and contained discrete caseous tubercles.

Extending from this group to the margin of the thorax there was a chain of seven or eight enlarged glands; these for the most part were indurated and contained discrete caseous tubercles; one was rather closely beset with caseous nodules becoming confluent; another near the thorax was caseous throughout and beginning to soften.

In the middle of the neck on the left side there was a group of four enlarged glands, the largest $1\frac{1}{4}$ in. by 1 in. by $\frac{1}{2}$ in.; one was caseous throughout; the others were beset with slightly gritty caseous nodules, ranging in size up to that of a hempseed; the latter glands showed a distinct increase in interstitial connective tissue.

Near the thorax on this side there was a gland the size of a sparrow's egg, composed throughout of friable gritty caseous substance which shelled out *en masse* from a slightly thickened capsule. There was also a smaller gland beset with caseous nodules.

Pharyngeal Glands.—On the right side there were two enlarged glands which had fused together to form a mass measuring $1\frac{3}{4}$ in. by 1 in. by $\frac{3}{4}$ in.; on section both glands were caseous throughout, softened, and slightly gritty from calcification. The left retro-pharyngeal gland measured $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. by about $\frac{1}{2}$ in., and was composed throughout of firm gritty caseous material beginning to soften around the periphery.

Abdomen.

The Omentum contained about half-a-dozen pinhead-sized hard grey tubercles.

There were a few scattered caseous nodules with fibrous margins between the coils of the large intestine.

The Peritoneum covering the right side of the diaphragm was slightly roughened, and showed about a dozen firm flattened grey nodules, the largest the size of a barley grain, with no sign of caseation in the centre.

Small Intestine.—A Peyer's patch in the early part of the intestine showed two small shallow depressions with smooth congested floor, the lymphoid tissue beneath which appeared atrophied (? healed ulcers); a patch a little further along showed a similar depression. With these exceptions the intestines were normal.

Large Intestine.—Normal.

Mesenteric Glands.—The chain of mesenteric glands contained caseous nodules of various sizes, irregularly distributed; three of the nodules were large, up to a broad bean; the others ranged in size from a hempseed to that of a large pea.

Ileo-colic Glands.—One contained a number of caseous nodules; two others each contained one caseous nodule.

Colic Glands.—Two colic glands were affected, each containing a pea-sized caseous nodule.

Spleen.—Not enlarged, showed projecting from the surface about thirty nodules, ranging in size from a millet to a hempseed; these on section had soft caseous centres and translucent fibrous margins; similar nodules were sparsely scattered throughout the pulp.

Liver.—The liver contained fairly numerous evenly distributed nodules similar to those in the spleen.

Portal Glands.—The glands in the small omentum were much enlarged; on section they showed discrete gritty caseous nodules and irregular caseous patches of various sizes, surrounded by fibroid glandular tissue.

Cœliac Glands.—Slightly enlarged, resembled on section the portal glands, but were not so advanced in caseation.

Kidneys.—The left kidney showed in the depth of the cortex a millet-seed sized tubercle with a caseous centre and a grey translucent margin. The right kidney appeared normal.

Suprarenal Bodies.—Normal.

Thorax.

Heart.—Normal.

Pleura.—Normal.

Lungs.—The lungs collapsed normally, and contained evenly distributed throughout the parenchyma numerous hard nodules, ranging in size from a millet-seed to a little larger than a hempseed; on section they were composed of a soft caseous centre containing gritty particles and a fibrous margin; there were no areas of consolidation.

Bronchial Glands.—The bronchial glands on both sides were enlarged, and showed on section firm yellow gritty caseous nodules, varying in size up to a large pea, embedded in fibroid glandular tissue.

Several small glands along the tracnea (thoracic) were advanced in caseation.

Dorsal Mediastinal Glands.—Normal.

Ventral Mediastinal Glands.—Each contained a few firm irregular caseous nodules up to a hemp-seed in size.

Larynx.—The mucous membrane of the larynx below the vocal chords showed some small greyish translucent growths containing yellow foci; on the mucous membrane in the angle of the thyroid cartilage there were some tuberculous granulations.

Various Lymphatic Glands.

Right Prescapular Gland.—Was much enlarged; on section the substance was fibroid and beset with soft caseous gritty nodules, the largest the size of a pea.

Left Prescapular Gland.—Normal.

Right Prepectoral Glands.—Normal.

In the prepectoral region on the left side there was a gland the size of a broad bean, which was partly caseous.

A lumbar gland contained a caseous nodule.

Iliac Glands.—On the left side one showed a caseous focus.

Two ileo-sacral glands each contained a number of caseous nodules up to a hempseed.

The Left Precrural Gland.—Contained two hempseed-sized gritty caseous nodules.

Microscopical Examination (Smear Preparation).

Left Tonsil.—No tubercle bacilli.

PIG 154.

Age—9 weeks.

Fed—Once with the culture obtained from the original material of Virus B. XXVIII. (The culture used was the 6th generation, 21 days old.)

Date—June 1st, 1906.

Dose—1·0 milligramme.

Killed—September 18th, 1906.

Duration of Experiment—109 days.

Clinical History

The pig showed no ill-health during the experiment and the temperature was practically normal throughout.

Weights.

	cwt.	qrs.	lbs.
June 5th, 1906 - - - -	0	1	9
September 18th, 1906 - - -	0	3	19

Gain in weight.—2 qrs. 10 lbs.

POST-MORTEM EXAMINATION.

Tonsils.—The surface of each tonsil was irregular and scarred (healed ulcers); there was no congestion of the mucous membrane; the substance of the left tonsil, normal in thickness, contained a few yellow foci; substance of right tonsil appeared normal; in the subtonsillar tissue in both cases there were a few soft caseous nodules. Extending from each tonsil to the enlarged submaxillary glands was a nodular caseous lymphatic vessel, the thickness of a crow quill.

Tongue and Pharynx.—Normal.

Submaxillary Glands.—On the left side near the angle of the jaw there were two enlarged glands fused together; one measured 1½ in. by 1 in. by 1 in., the other 1 in. in greatest diameter; both on section were caseous throughout and beginning to soften.

On the right side there were two glands similar in every respect to those on the left.

Cervical Glands.—The glands near the articulation of the jaw on the left side were normal. On the right side there was a gland the size of a thrush's egg, which was composed throughout of firm caseated tissue slightly gritty from calcification; a gland near the latter was normal. In the middle of the neck on the left side there was an indurated gland, 1 cm. in diameter, which was closely beset with yellow caseous slightly gritty tubercles becoming confluent; a gland the size of a broad bean posterior to the latter nearer the thorax was similarly affected. In the middle of the neck on the right side there was a slightly enlarged gland beset with irregular yellow caseous tubercles up to a hempseed in size.

Pharyngeal Glands.—On the right side one the size of a broad bean showed half its substance replaced by a firm friable slightly gritty caseous substance, the rest being beset with discrete caseous tubercles; a smaller gland posterior to the latter was caseous throughout. On the left side there was one gland similar to the first described on the right.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines, small and large.—Normal.

Mesenteric Glands.—About ten of the mesenteric glands were affected; four of these contained yellowish caseous masses 6 to 10 mm. in diameter; the others contained small discrete nodules singly and in groups.

Ileo-colic Glands.—One the size of a broad bean contained a caseous mass which replaced about half the substance; another showed a few discrete caseous tubercles.

Colic Glands.—One colic gland contained a group of soft caseous nodules; the rest appeared normal.

Spleen.—The spleen showed in the pulp half a dozen softened caseous nodules, with fibrous capsules, ranging in size from a pin's head to a small hempseed.

Liver.—Sparsely scattered throughout the substance were nodules which varied in size from a pin's head to a pea; on section they had soft caseous centres and fibrous margins.

Portal Glands.—Slightly enlarged, contained discrete firm yellow caseous nodules, the largest the size of a hempseed; they were irregular in outline and slightly gritty from calcification.

Coeliac Glands.—Two contained each a millet-seed sized yellow caseous tubercle.

Kidneys and Suprarenal Bodies.—Normal.

Thorax.

Lungs.—The lungs were pinkish, crepitant and collapsed normally; they contained moderately evenly distributed throughout the parenchyma hard nodules, ranging in size from a pin's head to a hempseed (160 nodules were counted in the left lung); on section the nodules had soft yellowish caseous interiors and fibrous margins; in the caseous substance when rubbed between the finger and thumb calcareous particles could be detected (this was the case also in the nodules in the liver and spleen); a few of the lung nodules were composed of firm reddish grey tissue, containing one or two calcareous particles and showing no sign of caseation.

Bronchial Glands.—The bronchial glands were slightly enlarged and indurated, and contained firm discrete yellow caseous nodules, ranging in size from a millet-seed up to that of a hempseed.

Dorsal and Ventral Mediastinal Glands.—Normal.

Heart and Pleura.—Normal.

Larnyx and Trachea.—Normal.

Lumbar, Iliac, Precrural, Prepectoral and Prescapular Glands.—Normal.

DOG 66.

Fed with Culture derived from the original material of Virus B. IV.

Dose—1·0 milligramme.

Date—July 10th, 1905.

Initial Weight—4,270 grammes.

Final Weight—4,350 grammes.

Gain in Weight—80 grammes.

Killed—November 20th, 1905. 133 days after the experiment began.

Tuberculin Test.

September 20th, 1905. 71 days after feeding. Negative Dose of tuberculin 5·0 cubic centimetres.

POST-MORTEM EXAMINATION.

Tonsils and Intestines.—Normal.

Pharyngeal, Submaxillary, Cervical, Mesenteric, Ileo-Colic and Colic Glands.—Normal.

Lungs, Bronchial Glands, Liver, Spleen, Kidneys and Suprarenal Bodies.—Normal.

A guinea-pig inoculated with an emulsion made from the mesenteric glands died in 16 days, and showed no tuberculous lesions.

DOG 68.

Fed with Culture derived from the original material of Virus B. IV.

Dose—1·0 milligramme.

Date—July 10th, 1905.

Killed—October 30th, 1905. 112 days after the experiment began.

Tuberculin Test.

September 20th, 1905. Negative. Dose of tuberculin, 5·0 cubic centimetres.

POST-MORTEM EXAMINATION.

Tonsils and Intestines.—Normal.

All the glands in connection with the alimentary tract were normal.

All other glands and all the organs were normal to the naked eye.

DOG 98.

Fed with Culture derived from the original material of Virus B. X. (through Guinea-pig 1070).

Dose—10 milligrammes.

Date—February 5th, 1906.

Killed—May 17th, 1906. 101 days after the experiment began.

Tuberculin Test.

May 10th, 1906. Negative.

POST-MORTEM EXAMINATION.

Pharynx and Tonsils.—Normal.

Intestines, Large and Small.—Normal.

Neck Glands, Mesenteric, Ileo-Colic and Colic Glands.—Normal.

Thorax :

The Lungs were perfectly normal in general appearance. They contained two miliary tubercles, one quite transparent, the other somewhat translucent.

Pleura and Heart.—Normal.

Spleen.—Normal.

Liver.—In the substance of the liver near the thin margin there were two greyish-green somewhat translucent foci, each a little more than 1 mm. in diameter, and also a small group of similar foci some of which had coalesced; on the capsule around the latter there was a number of minute grey points (not apparently of a tuberculous nature); elsewhere the liver was normal.

Portal Gland.—Normal.

Kidneys.—There were several small clear cysts in the cortex of each kidney.

Suprarenal Bodies.—Normal.

Peripheral Lymphatic Glands.—Normal.

DOG 100.

Fed with Culture derived from the original material of Virus B. IX.

Dose—10 milligrammes.

Date—February 6th, 1906.

Killed—May 17th, 1906. 100 days after the experiment began.

Tuberculin Test.

May 10th, 1906. Negative.

POST-MORTEM EXAMINATION.

Tongue, Pharynx and Tonsils.—Normal.

Intestines.—Normal.

Neck Glands, Gastric, Mesenteric, Ileo-Colic and Colic Glands.—Normal.

Lungs.—The lungs were pinkish and crepitant and collapsed normally; they contained one hard grey tubercle, about 1·5 mm. in diameter.

Bronchial Glands.—Normal.

Heart and Pleura.—Normal.

Spleen, Kidneys, Liver, and Portal Gland.—Normal.

All the Superficial Lymphatic Glands were normal.

DOG 102.

Fed with Culture derived from the original material of Virus B. VIII.

Dose—100 milligrammes.

Date—March 7th, 1906.

Killed—May 18th, 1906. 72 days after the experiment began.

Tuberculin Test.

May 10th, 1906. The temperature rose slightly (0·4° C. 10 hours after inoculation.

POST-MORTEM EXAMINATION.

Tongue, Pharynx, and Tonsils.—Normal.

Intestines.—Normal.

Neck Glands, Mesenteric and Colic Glands.—Normal.

Lungs.—The lungs were crepitant throughout and collapsed normally; in one lobe there was a hard grey nodule, about 2 mm. in diameter, with an irregular tough whitish centre; the nodule was situated just under the pleura and projected slightly from the surface; with this exception the lungs were normal.

Bronchial Glands.—Normal.

Heart and Pleura.—Normal.

Spleen, Liver, Portal Gland and Kidneys.—Normal.

Superficial Lymphatic Glands.—Normal.

Microscopical Examination.

A smear preparation from the lung nodule showed one tubercle bacillus.

A culture of the tubercle bacillus was isolated from the lung nodule.

DOG 104.

Fed with Culture derived from the original material of Virus B. IV

Dose—33·3 miliegrammes.

Date—March 7th, 1906.

Killed—June 1st, 1906. 86 days after the experiment began.

Tuberculin Test.

May 10th, 1906. Negative.

POST-MORTEM EXAMINATION.

Tongue, Tonsils, and Pharynx.—Normal.

Intestines.—Normal.

All the glands in the neck, the mesenteric, ileo-colic and colic glands were normal.

Lungs.—Each caudal lobe contained a shotty semi-transparent tubercle, the size of a millet-seed.

Bronchial Glands, Heart and Pleura.—Normal.

Spleen, Liver, Portal Gland and Kidneys.—Normal.

All other Lymphatic Glands were normal.

DOG 106.

Fed with Culture from the original material of Virus B. V. through Guinea-pig 711.

Dose—10 milligrammes.

Date—March 8th, 1906.

Killed—June 6th, 1906. 90 days after the experiment began.

Tuberculin Test.

May 10th, 1906. Negative.

POST-MORTEM EXAMINATION.

Tongue, Tonsils and Pharynx.—Normal.

Intestines.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Mesenteric Glands.—One showed in the cortex just under the capsule a pin-head sized yellow focus; other mesenteric glands were normal.

Ileo-Colic and Colic Glands.—Normal.

Lungs.—The lungs contained about half a dozen widely distributed pin-head sized hard grey tubercles, two of which were slightly opaque in the centre.

Bronchial Glands, Heart and Pleura.—Normal.

Spleen, Liver and Portal Gland.—Normal.

The Left Kidney showed on the surface a minute whitish speck.

The Right Kidney was normal.

Lumbar, Iliac, and all Peripheral Lymphatic Glands were normal.

CAT 86 (Adult).

Fed with Culture derived from the original material of Virus B. XXVI.

Date—June 5th, 1906.

Dose—10 milligrammes.

Initial Weight—1,750 grammes. Final weight 1,830 grammes.

Killed—August 15th, 1906, 71 days later.

POST-MORTEM EXAMINATION.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Intestines.—Normal throughout.

Gastric Glands.—Normal.

Mesenteric Glands.—Normal in size; one at the anterior end showed two or three minute indefinite whitish points; the rest were perfectly normal.

Ileo-colic and Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Gland.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Lungs.—In the right cephalic lobe there was a grey translucent tubercle, 1 mm. in diameter; in the right middle lobe just under the pleura was a minute grey tubercle about 0·5 mm. in diameter; in the right caudal lobe under the pleura there were about half a dozen grey tubercles slightly opaque in the centre, the largest the size of a millet seed.

In the left cephalic lobe there was a hard grey millet seed sized tubercle ; the left caudal lobe contained two firm grey nodules, the largest the size of a pea, not definitely circumscribed ; on section they showed a faint yellowish mottling ; there were besides three or four small grey tubercles with slightly opaque centres.

Bronchial Glands.—Normal in size and appearance.

Pleura and Heart.—Normal.

Axillary, Inguinal and Iliac Glands.—Normal.

Microscopical Examination (Smear Preparations).

Mesenteric Gland.—No tubercle bacilli.

Lung (small tubercle).—Tubercle bacilli.

Lung (nodule).—No tubercle bacilli.

CAT 88 (Adult).

Fed with Culture derived from the original material of Virus B. XXVI.

Date—June 5th, 1906.

Dose—10 milligrammes.

Initial Weight—2,500 grammes. Final Weight, 1,950 grammes.

Killed—August 17th, 1906, 73 days after.

POST-MORTEM EXAMINATION.

Tongue and Pharynx.—Normal.

Tonsils.—The right tonsil appeared slightly enlarged and showed on section a whitish caseous focus. The left tonsil contained a minute white point.

The Right Retro-Pharyngeal Gland was slightly enlarged and indurated, and showed on section a small irregular firm yellow caseous mass and a few caseous foci.

The Left Pharyngeal Gland showed in the cortex a number of irregular yellowish white caseous foci, the largest about 1·5 mm. in diameter.

The Left Submaxillary Gland contained a caseous mass, 1 cm. in diameter, beginning to break down in the centre.

The Right Submaxillary Gland was normal.

Cervical Glands.—Normal.

Intestines.—Normal throughout.

Gastric Glands.—Normal.

Mesenteric Glands.—The mesenteric glands were a little enlarged and felt firmer than normal. On section the majority showed arranged around the cortices irregular firm yellowish white patches of caseation of various sizes ; in one of the anterior glands these were almost continuous round the cortex ; the caseous areas were separated from the capsule by a narrow line of normal looking gland tissue.

The Ileo-colic Glands contained a few yellow caseous tubercles up to about 1·5 mm. in diameter.

Colic Glands.—Normal.

Omentum and Peritoneum.—Normal.

The Spleen contained one pea-sized nodule which projected prominently from the surface ; on section it was composed of yellow friable caseous substance surrounded by a narrow zone of grey translucent tissue.

The Liver showed on the surface under the capsule an opaque yellow speck ; otherwise normal.

The Portal Gland contained a minute caseous focus.

Kidneys and Suprarenal Bodies.—Normal.

Lungs.—The lungs did not collapse well and were somewhat congested and felt firmer than normal. They showed on the surface very numerous slightly raised grey tubercles, the largest the size of a millet seed, the majority of which were yellow and caseous in the centre; on section similar tubercles were evenly distributed throughout the parenchyma. The cephalic lobes, the left particularly, were diffusely consolidated.

The Bronchial Glands were larger and firmer than normal; each contained one or two caseous foci.

Heart and Pleura.—Normal.

Lumbar, Iliac and Inguinal Glands.—Normal.

Microscopical Examination (Smear Preparations).

Right Tonsil.—Six tubercle bacilli.

Left Tonsil.—Two tubercle bacilli.

Liver.—No tubercle bacilli.

RABBIT 53.

Fed on June 8th, 1904, with 0.5 milligramme of culture derived from Guinea-pig 14 (Virus B. I.). The culture used was 19 days old, 20th generation.

Initial Weight—2,380 grammes.

Final Weight—2,650 grammes.

Gain in Weight—270 grammes.

Killed—July 9th, 1904. 31 days after.

POST-MORTEM EXAMINATION.

Small Intestine.—Normal.

Vermiform Appendix.—Showed in the lymphoid tissue under the serosa two opaque yellowish white foci.

Cæcum and Colon—Normal.

Submaxillary, Cervical, Mesenteric and Colic Glands.—Normal.

Lungs.—The left cephalic lobe contained two mustard seed sized grey tubercles slightly opaque in the centre.

Left Bronchial Gland.—Was larger and firmer than normal, but showed no opaque foci.

Liver, Spleen, Kidneys and Suprarenal Bodies.—Were free from visible tuberculous lesions.

Peritoneum, Pleura and Heart.—Normal.

Microscopical Examination. (Smear Preparations.)

Tubercle bacilli found in the appendix ; none in the lung and left bronchial gland.

RABBIT 54.

Fed on June 8th, 1904 with 5·0 milligrammes of culture obtained from Guinea-pig 14 (Virus B. I.). The culture used was 19 days old, 20th generation.

Initial Weight—2,110 grammes.

Final Weight—2,200 grammes.

Gain in Weight—90 grammes.

Killed—July 19th, 1904. 31 days later.

POST-MORTEM EXAMINATION.

Right Submaxillary Gland.—Was slightly enlarged and showed in the cortex two soft whitish miliary tubercles; the left submaxillary gland contained a minute caseous focus.

Left Cervical Gland.—Contained a soft caseous nodule, 2 mm. in diameter; the right several minute caseous foci.

Intestines, Large and Small.—Normal.

Vermiform Appendix.—Showed in the lymphoid tissue of its terminal half about half a dozen soft whitish foci.

Mesenteric, Colic and Portal Glands.—Normal.

Spleen, Kidneys and Suprarenal Bodies.—Normal.

Liver.—Showed under the capsule two opaque yellow tubercles, the size of mustard seeds.

Lungs.—In the depth of the right cephalic lobe near the bronchus there were two hard nodules, each about 2 mm. in diameter, with caseous centres and grey margins.

Thoracic Glands, Pleura and Peritoneum.—Normal.

Microscopical Examination.

No tubercle bacilli were found in any of the lesions.

GUINEA-PIG 1044.

Fed on June 8th, 1904, with 0·5 milligramme of culture obtained from Guinea-pig 14 (Virus B. I.). The culture was the 20th generation, 19 days old.

Initial Weight—300 grammes.

Final Weight—420 grammes.

Gain in Weight—120 grammes.

Killed—July 19th, 1904. 31 days later.

POST-MORTEM EXAMINATION.

Intestines and Mesenteric and Ileo-Colic Glands.—Normal.

Submental Glands.—Both were enlarged and indurated, and each showed on section a firm caseous nodule, 5 mm. in diameter.

Left Cervical Gland.—Was slightly enlarged and indurated and contained one caseous focus.

Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Showed under the capsule a few doubtful yellowish white specks.

Portal, Coeliac, Lumbar and Iliac Glands.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Heart.—Normal.

Lungs and Thoracic Glands.—Normal.

Microscopical Examination.

Tubercle bacilli in submental gland; no tubercle bacilli in cervical gland or spleen.

GUINEA-PIG 1045.

Fed on June 8th, 1904, with 5 milligrammes of culture obtained from Guinea-pig 14 (Virus B. I.). The culture used was 19 days old, 20th generation.

Initial Weight—360 grammes.

Final Weight—400 grammes.

Gain in Weight—40 grammes.

Killed—July 19th, 1904, 31 days later.

POST-MORTEM EXAMINATION.

Intestines.—Two Peyer's patches in the ileum showed minute yellow foci. Otherwise the intestines were normal.

Submental and Right Submaxillary Glands.—Were much enlarged, caseous and softened. The left cervical gland contained a caseous softened nodule 5 mm. in diameter.

Mesenteric Glands.—Three were enlarged, indurated and partly caseous.

Ileo-colic Gland.—One was slightly enlarged and showed on section a caseating nodule 4 mm. in diameter.

Colic Gland.—One contained a minute point

Spleen.—Showed four or five shot-sized caseating tubercles.

Liver, Kidneys and Suprarenal Bodies.—Normal.

There was a small caseous tubercle in the portal gland.

Lungs.—Contained a moderate number of grey miliary tubercles; the bronchial glands were apparently normal.

Microscopical Examination.

Tubercle bacilli in ileum, mesenteric gland and lung; no tubercle bacilli in the spleen or a submaxillary gland.

ABSTRACTS OF POST-MORTEM NOTES OF GUINEA-PIGS FED WITH THE TUBERCULOUS MILK OF COW 44 (*See* Table I A).

Number of Guinea-Pig.	Duration of Feeding.	Duration of Life.	Result.
*740	6 days	26 days. (Killed)	In the small intestine there were three caseous nodules in Peyer's patches, each about 5 mm. in diameter ; no ulceration. Three mesenteric glands in the anterior part of the mesentery were indurated and showed yellow foci. Other glands and all organs appeared normal. MICROSCOPICAL : No T.B. found in intestine or mesenteric gland.
*741	6 days	26 days (Killed)	Small intestine. Under the mucous membrane of the ileum there were three minute greyish-white foci and a caseous nodule in a Peyer's patch. Three mesenteric glands showed minute yellow foci. Two submental glands were enlarged and indurated ; one contained a softened caseous nodule 5 mm. in diameter ; the other and a left submaxillary gland showed small opaque foci. Other glands and all organs normal. MICROSCOPICAL : T.B. in intestine. None in mesenteric gland.
*742	6 days	26 days (Killed)	About the middle of the intestine a Peyer's patch contained a caseous nodule 2 mm. in diameter. One mesenteric gland contained a hard translucent nodule which was not caseous. Two colic glands contained nodules just beginning to caseate. No tuberculosis elsewhere. MICROSCOPICAL : Numerous T.B. in intestinal nodule, a few in a colic gland.
*743	6 days	26 days (Killed)	There were four caseous nodules in Peyer's patches at irregular intervals along small intestine, first 4″ from pylorus. The gland lying near the second part of the duodenum was indurated and showed a caseating nodule. One mesenteric and one colic gland showed early foci of caseation. MICROSCOPICAL : Numerous T.B. in intestinal nodule.
727	11 days	11 days (Died)	No macroscopical evidence of tuberculosis.
728	11 days	(11 days) (Died)	
*729	11 days	40 days (Killed)	One of the Peyer's patches in the ileum (18″ from the ileo-cœcal valve) contained a small firm caseous nodule. Two mesenteric glands showed caseous and softened nodules ; the ileo-colic glands (6 in number) were enlarged, indurated and caseating. The liver showed a number of greyish-white foci and two or three irregular nodules. There was a yellow focus in the portal gland. The spleen showed about 10 small greyish-white tubercles. Other organs and glands were normal. MICROSCOPICAL : T.B. in an ileo-colic gland and in the spleen.
730	11 days	40 days (Killed)	The ileum showed a firm caseous nodule, 5 mm. in diameter, 13″ from the ileo-cœcal valve. Two ileo-colic glands were enlarged, indurated and caseating. The left submaxillary gland was practically entirely caseous. Other lymphatic glands and all organs were normal. MICROSCOPICAL : T.B. after prolonged search found in a mesenteric gland ; none in intestinal nodule or submaxillary gland.

* All the Guinea-pigs marked with an asterisk were accidentally killed.

ABSTRACTS OF POST-MORTEM NOTES OF GUINEA-PIGS FED WITH THE TUBERCULOUS MILK OF COW 64 (*See* Table I A.)

Number of Guinea-Pig.	Duration of Feeding.	Duration of Life.	RESULT.
814	Fed once with 0·25 cc. milk = about 250,000 T.B.	114 days (Killed)	No tuberculosis.
815	Ditto - -	18 days (Died)	Small intestine normal except for one Peyer's patch near the pylorus which contained an opaque yellow point. There was a yellowish area, ¼-in. in diameter, in the cœcum, which when cut into showed soft caseo-pus ; two lymphoid patches showed minute opaque foci. Mesenteric glands enlarged ; one contained numerous caseous foci. The ileo-colic glands showed caseous softened foci and firm caseous areas. Spleen, twice the normal, filled with mustard-seed-sized, greyish-white tubercles. Liver beset with greyish-white irregular foci, largest diameter of a shot. Portal gland large : no opaque foci seen. Other organs and glands normal. MICROSCOPICAL :—No T.B. in mesenteric gland or cœcum. T.B. (not numerous) in spleen.

ABSTRACTS OF POST-MORTEM NOTES OF GUINEA-PIGS FED WITH THE TUBERCULOUS MILK OF COW 172 (*See* Table IV. A).

Number of Guinea-Pig.	Duration of Feeding.	Duration of Life.	RESULT.
1,021	From May 31, 1904, to July 22, 1904 (52 days) (every third day for the first fortnight and every day for the rest of the period)	52 days (Killed)	In left caudal lobe under the pleura there were little groups (4 to 6) of translucent tubercles, the largest the size of rape-seeds. Bronchial glands normal. Liver showed a few minute yellowish points. Other organs and glands normal. MICROSCOPICAL :—T.B. numerous in liver.
1,024	ditto	52 days (Killed)	Intestines and mesenteric glands normal. The liver showed on the surface a few minute yellow points. Spleen, lungs and kidneys normal. Left bronchial gland large, firm, and on section almost entirely destroyed by caseation. Right bronchial gland contained a caseating nodule 3 mm. in diameter. Other glands normal. MICROSCOPICAL :—Numerous T.B. in the bronchial glands ; two seen in a focus from the liver.
1,022	ditto	79 days (Killed)	12″ from the pylorus there was a disc-like thickening of the wall of the intestine, 1 cm. in diameter ; on the internal surface it projected above the mucous membrane and showed at one margin a small circular punched-out ulcer ; on section the nodule was caseous in the centre and beginning to soften. The rest of the intestines were normal. Mesenteric glands : one 2 × 1·2 × 1·2 cm. very indurated, and, except for a small patch of translucent tissue, caseous throughout ; other mesenteric, the ileo-colic and the colic glands were normal. The liver showed 3 or 4 grey translucent nodules about 2 mm. in diameter. Spleen, slightly enlarged, contained six irregular caseating nodules 2 to 6 or 7 mm. in diameter. The portal and right bronchial glands were enlarged and indurated and showed firm caseous patches ; the left bronchial contained a caseous focus, the coeliac a caseous nodule. In the right caudal lobe there were 2 or 3 pin-head sized translucent tubercles. Other organs and glands were normal. MICROSCOPICAL :—T.B. in intestine, mesenteric gland, spleen and right bronchial gland ; none in the liver.

LIST OF FOUR WHITE RATS FED WITH TUBERCULOUS MILK AND TEN FED WITH TUBERCULOUS TISSUES.

Number of rat.	Material used for feeding.	Duration of feeding.	Duration of life.	Result.
10	Milk of Cow 44	20 days	Died, 138 days	No sign of tuberculosis. Right lung consolidated; contained 6 to 8 yellow nodules with thin walls and greenish-yellow purulent contents. No tubercle bacilli found in the pus.
11	Milk of Cow 44	20 days	Killed, 140 days	All organs and glands were perfectly normal in appearance. Microscopical: T.B. were found in an ileo-colic gland; none in a mid-mesenteric gland and none in a Peyer's patch.
12	Milk of Cow 44	20 days	Killed, 140 days	Organs and glands normal to the naked eye. Microscopical: Mesenteric glands (2 smears).—No T.B. Ileo-colic gland and spleen.—No T.B. Cœliac gland.—T.B. in small numbers.
13	Milk of Cow 44	20 days	Killed, 140 days	All organs and glands were perfectly normal in appearance. Microscopical: Lymphatic follicle in large intestine. No T.B. Mesenteric gland.—Moderately numerous T.B. Cœliac gland.—No T.B.
14	The tuberculous organs of fifteen guinea-pigs.	23 days	Died, 101 days	Intestines normal. Mesenteric glands not enlarged. Liver, spleen, and kidneys normal. Lungs: Posterior part of the left caudal lobe consolidated. All the lobes of the right lung were collapsed and consolidated; they contained numerous thin-walled cavities filled with yellow pus. One of these cavities was loculated and almost completely replaced the tissue of the right caudal lobe. Microscopical: A few T.B. in the mesenteric gland; none in the pus from the lung.
15			Died, 151 days	No tuberculous lesions in the mesenteric glands or in any of the organs. The right lung was collapsed, all functional tissue being replaced by thin-walled cysts, some the size of a large pea, filled with thick greenish-yellow pus. The left lung was bulky and the heart displaced to the right side. Microscopical: Fairly numerous T.B. were found in a smear made from a mesenteric gland.
16			Killed, 198 days	Body very fat and well nourished. Intestines and mesenteric glands normal. There was a small whitish-yellow nodule in the liver beneath the capsule. The lungs were partly consolidated and showed a few yellow nodules. Microscopical: No T.B. found in mesenteric gland, liver, or lungs.
17			Killed, 198 days	Right cephalic lobe consolidated; surface nodular, showed on section small cavities filled with a translucent jelly-like material. Other organs and all glands normal. Microscopical: No T.B. in mesenteric glands or lungs. G.P. 1058 inoculated with an emulsion made from the mesenteric glands remained healthy.
18	The tuberculous organs of fifteen guinea-pigs.	12 days	Died, 26 days	The lungs were consolidated and showed numerous yellow softened nodules. Other organs and all glands were normal. Microscopical: No T.B. in a mesenteric gland or lung nodule. 1 T.B found in an ileo-colic gland.
19		12 days	Killed, 139 days	All organs and glands normal to the naked eye. Microscopical: T.B. found in small number in a smear made from the mesenteric gland.
20		12 days	Killed, 139 days	Organs and glands perfectly normal in appearance. Microscopical: No T.B. in mesenteric gland or in lung.
21		12 days	Killed, 167 days	Intestines and mesenteric glands normal. In the liver substance, beneath the capsule, there was a mustard-seed-sized yellow focus, which easily shelled out. Lungs: Anterior lobes reddish and consolidated, nodular on the surface, showed on section little cavities filled with a translucent mucinous substance. Microscopical: No T.B. in a mesenteric gland, an ileo-colic gland, liver or lungs (2 smears).
22		12 days	Died, 192 days	Lungs congested; in the depth of one lobe there was a small hard nodule filled with thick yellow purulent material. Body normal elsewhere. Microscopical: Numerous T.B. in a smear from a mesenteric gland.
23		12 days	Died, 241 days	Right lung packed with thin-walled cysts the size of peas, filled with thick greenish-yellow pus; lung enlarged. Other organs and all glands normal. Microscopical: T.B. in mesenteric gland; none in ileo-colic gland, spleen, or lung.

LIST OF WHITE RATS FED WITH TUBERCULOUS MILK AND TISSUES.

Number of Rat.	Material used for Feeding.	Duration of Feeding.	Duration of Experiment.*	RESULT.
25	Tuberculous milk and the tuberculous organs of four rabbits and 12 guinea-pigs	Fed for 11 days on tuberculous milk and during 33 days on tuberculous tissues	Killed, 44 days	Organs and glands all healthy except lungs, which showed consolidation of cephalic lobes ; the consolidated parts were red and contained greyish nodules (size of small shot) filled with pale mucinous material. Microscopical : T.B. found in mesenteric glands ; none in an ileo-colic gland or in the lungs.
31	do.	do.	Killed, 44 days	Organs and glands all healthy. Microscopical : Moderately numerous T.B. in a mesenteric gland ; none in an ileo-colic gland or in the lungs.
26	do.	do.	Died, 62 days	Organs and glands all healthy except lungs, which were partly solid and contained grey translucent nodules softened in the centre (not tuberculous).
32	do.	do.	Died, 61 days	Intestines and mesenteric glands normal. The liver contained near the margin a dry yellow cheesy body about the size of a pin's head. The right lung was collapsed and consolidated and packed with thin walled cysts filled with yellow purulent material ; the left lung was enlarged and contained one translucent tubercle. Microscopical : Mesenteric glands, numerous tubercle bacilli ; liver and lung, no T.B.
27	do.	do.	Killed, 93 days	Organs and glands perfectly healthy. Microscopical : A few T.B. found in smears from the mesenteric glands.
33	do.	do.	Killed, 93 days	Organs and glands all quite healthy. Microscopical : A few T.B. were found in smears from the mesenteric glands.
28	do.	do.	Killed, 221 days	Intestines and mesenteric glands normal. An ileo-colic gland was slightly enlarged and showed an opaque yellow focus. Other organs and glands normal. Microscopical : Numerous T.B. in a mesenteric gland ; none in the ileo-colic gland.
34	do.	do.	Died, 167 days	Left lobes of lung consolidated, dark red in colour, contained small cavities filled with mucoid material ; bronchi contained yellow muco-pus. Other organs and all glands normal. Microscopical : Smears from lungs and mesenteric gland showed no T.B.
29	do.	do.	Killed, 222 days	Cephalic lobes of lungs consolidated and studded with little grey tubercles, which projected on the surface ; in the caudal lobe there was a larger grey nodule. Other organs and all glands normal to the naked eye. Microscopical : Smears, 8 T.B. in a mesenteric gland and 3 in an ileo-colic gland. Paraffin sections. The mesenteric gland showed a small area of necrosis with an amorphorus granular appearance ; in each of these areas there were fairly numerous tubercle bacilli.
35	do.	do.	Killed, 221 days	All organs and glands normal. Microscopical : Smear preparations ; mesenteric gland, no T.B. ; ileo-colic gland (?) 1 T.B.
30	do.	do.	Killed, 257 days	The mesenteric glands were normal in size ; close inspection revealed some extremely minute greyish-white specks in the cortex ; a few similar specks were seen in an ileo-colic gland. Other glands and all organs were normal. Microscopical : T.B. in smear from mesenteric gland ; none in ileo-colic gland. Paraffin sections of the ileo-colic gland revealed no foci of necrosis, and no tubercle bacilli were found, in fact the gland appeared perfectly normal.
36	do.	do.	Killed, 276 days	Intestines and mesenteric glands normal. An ileo-colic gland showed one or two minute spots. Spleen and liver normal. Anterior lobes of lungs consolidated. Microscopical : T.B. fairly numerous in a mesenteric gland ; scanty in an ileo-colic gland ; none seen in the lung.

* Calculated from the day the feeding began.

ABSTRACTS OF THE POST-MORTEM NOTES OF TEN HEDGEHOGS.

HEDGEHOG 2.

Fed with tuberculous milk of Cow 172 from July 10th until June 23rd, 1904.

Duration of Feeding—43 days.

Killed—June 23rd, 1904. [43 days after the experiment began.]

POST-MORTEM EXAMINATION.

Organs and glands all healthy, except the lung, one lobe of which showed a small patch of collapse.

Microscopical.

No T.B. in lung, submaxillary gland, cervical gland or spleen.

HEDGEHOG 4.

Fed with tuberculous milk of Cow 172 from June 10th until July 23rd, 1904.

Duration of Feeding—43 days.

Died—October 16th, 1904, 128 days from the beginning of the experiment.

POST-MORTEM EXAMINATION.

Tonsils and pharynx normal. The left cervical gland was much enlarged and was yellow caseous and softened practically throughout. The right cervical gland showed a few caseous foci. The left pharyngeal gland contained a group of small caseous tubercles; the right was normal. Submaxillary glands normal. Liver pale, showed several fatty-looking patches. Kidneys enlarged and congested, capsules stripped readily; a smear made from the kidney tissue showed numerous polynuclear leucocytes. Intestines and mesenteric glands normal. Lungs, spleen, and suprarenal bodies normal.

Microscopical.

Moderately numerous T.B. in left cervical gland; none in a mesenteric gland, spleen, kidney or liver.

HEDGEHOG 10.

Fed once on July 27th, 1904, with tuberculous milk of Cow 164.

Amount of Milk—28·3 c.c.

Number of Tubercle Bacilli—1,000,000.

Died—August 22nd, 1904.

Duration of Experiment—26 days.

POST-MORTEM EXAMINATION.

Intestines, cervical and mesenteric glands normal. Liver, spleen, kidneys and suprarenal bodies normal. Lungs; right cephalic lobe firm red and consolidated; in the right anterior and middle lobes there were small patches of consolidation; both posterior lobes showed numerous dark grey bodies about the size of rape seeds; they could be distinctly felt between the finger and thumb. Bronchial glands normal.

Microscopical.

Mesenteric gland	No T. B.
Lung tubercle	No T. B.
Solid patch in lung	No T. B.

HEDGEHOG 12.

Fed once on July 27th, 1904, with tuberculous milk of Cow 164.

Amount of Milk—28·3 c.c.

Number of Tubercle Bacilli—1,000,000.

Died—October 7th, 1904.

Duration of Experiment—72 days.

POST-MORTEM EXAMINATION.

Intestines and mesenteric glands normal. In each posterior lobe of the lung there were several minute dark grey spherical bodies. (See Hedgehog 10.) Other organs normal.

Microscopical.

Two smears from the lung tubercles showed no tubercle bacilli.

HEDGEHOG 14.

Fed once on August 3rd, 1904 with an emulsion (mixed with milk) made from the tuberculous organs of G.P. 1041 (inoculated with milk of Cow 172).

Died—September 27th, 1904. 55 days after.

POST-MORTEM EXAMINATION.

Tonsils normal. Left cervical gland slightly enlarged, contained a caseous focus about 2 mm. in diameter surrounded by a zone of firm translucent tissue. Right cervical gland normal. Left retro-pharyngeal gland enlarged showed on section a small soft caseous focus. In the right pharyngeal gland there was a minute yellow speck. The omentum contained from 1 to 10 hard dry yellow bodies, between 2 and 3 mm. in length, and 1 to 1·5 mm. in thickness; crushed between ground glass plates, they were gritty and yielded with a little water a chalky white emulsion. Nothing abnormal was seen elsewhere

Microscopical.

Smears from the left cervical gland and the left retro-pharyngeal showed very numerous tubercle bacilli; the bacilli varied much in length, some being very long, curved and beaded; in some of the bacilli round deeply stained bodies were seen, usually at the poles, but occasionally in the centre of the bacillus. Moderately numerous tubercle bacilli were found in one of the small bodies in the omentum, and also in a mesenteric gland (the mesenteric glands were normal in size and appearance); a few T.B. were found in the spleen.

HEDGEHOG 16.

Fed on August 3rd, 1904, with an emulsion (mixed with milk) made from the tuberculous organs of G.P. 1041. (Inoculated with milk of Cow 172.)

Died—October 2nd, 1904—60 days later.

POST-MORTEM EXAMINATION.

A gland on the left side, near the angle of the jaw, showed in the cortex an opaque greyish-white patch, about 2·5 mm. in diameter. Other glands in the neck were normal. Stomach: The mucous membrane showed large patches of hæmorrhage, but no ulceration. Small intestine: There were several patches of hæmorrhage in the mucous membrane; to many of these areas a little mass of yellow mucinous material was adherent. The mesenteric glands were normal in size and appearance. The lungs showed. scattered throughout the substance, but chiefly in the posterior lobes, minute dark-grey bodies (?) tubercles. Spleen, liver and kidneys normal.

Microscopical.

Numerous T.B. in the nodule in the gland in the neck; a few in a smear from the mesenteric glands; none in the spleen.

HEDGEHOG 30.

Fed on September 26th, 1905, with 10·0 milligrammes of culture derived from the original material of Virus B. XXI.

Died—November 20th, 1905. 55 days later.

POST-MORTEM EXAMINATION.

All the organs and glands were perfectly normal to the naked eye.

HEDGEHOG 32.

Fed on September 26th, 1905, with 10·0 milligrammes of culture derived from the original material of Virus B. XXI.

Died—November 17th, 1905. 52 days later.

POST-MORTEM EXAMINATION.

Tonsils.—Normal.

Right Pharyngeal Gland.—Showed a minute greyish white focus.

Left Pharyngeal Gland.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal in appearance.

All the organs and all the lymphatic glands (not mentioned above) were normal.

Microscopical Examination. (Smear Preparations.)

Pharyngeal Gland.—Several tubercle bacilli found.

Mesenteric Gland.—No tubercle bacilli.

Spleen.—No tubercle bacilli.

HEDGEHOG 20.

Fed on July 10th, 1905, with 1 milligramme of culture from the original material of Virus B. IX.

Killed—When ill, August 26th, 47 days after feeding.

POST-MORTEM EXAMINATION.

All the organs and lymphatic glands were normal to the naked eye.

Microscopical Examination.

Submaxillary Gland.—No tubercle bacilli.

Cervical Gand.—No tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli.

HEDGEHOG 18.

Fed on June 2nd, 1905, with 1 milligramme of culture from the original material of Virus B. IX.

Killed—September 21st, 1905, 111 days after.

POST-MORTEM EXAMINATION.

Organs and glands perfectly healthy.

ADDITIONAL FEEDING EXPERIMENTS.

These experiments were carried out with a view to obtaining precise information as to the course of infection in animals fed with bovine tubercle bacilli.

The experiments consisted in feeding animals with large doses of tubercle bacilli (cultures and emulsions of tuberculous tissues), killing them at short intervals subsequently and inoculating emulsions of different organs and glands into guinea-pigs. Thirteen dogs, five pigs and one monkey were used. In eleven of the dogs and in the monkey chyle from the thoracic duct was collected at varying intervals after feeding and inoculated into guinea-pigs. I am indebted to Dr. Shore, Lecturer in Physiology in the University of Cambridge, for demonstrating to me the method of exposing, and withdrawing chyle from, the thoracic duct.

The operation of inserting a cannula into the duct was not in all cases attended with success. Whenever the attempt failed the chyle was allowed to flow into the wound from which it was pipetted. All the operations were formed with sterile instruments and every precaution taken to prevent accidental contamination, so that the collection of chyle from the wound instead of through a cannula does not appear to possess any serious objection.

DOGS.

In two of the experiments on dogs three guinea-pigs[*] inoculated with chyle were found on post-mortem examination to be tuberculous; the tuberculosis in these animals had originated in the thorax and was therefore not produced by the material inoculated.

With these exceptions none of the guinea-pigs inoculated with chyle showed tuberculous lesions on post-mortem examination.

In every case guinea-pigs were inoculated with emulsions made from the mesenteric glands and in some instances emulsions from the lungs, bronchial glands or liver were inoculated as well. None of the latter animals became tuberculous. In six of the experiments the guinea-pigs inoculated from the mesenteric glands developed tuberculosis, in six they remained healthy and in one they died of an acute infection.

The results of these inoculations are given in tabular form.

No. of Dog.	Age.	Glands removed after feeding.	Result of Inoculation into Guinea-pigs.
2	Adult	6½ hours	No tuberculosis.
4	„	5 „	One guinea-pig became tuberculous.
10	Young	24 „	The guinea-pigs died of an acute infection.
28	„	6½ „	No tuberculosis.
32	Adult	5 „	Two guinea-pigs became tuberculous.
34	Young	4½ „	No tuberculosis.
36	„	3½ „	Two guinea-pigs became tuberculous.
38	„	24 „	One guinea-pig showed slight tuberculosis.
40	„	96 „	Two guinea-pigs became tuberculous.
42	About 18 months	6½ „	No tuberculosis.
44	Adult	4 „	„
46	„	3 „	„
94	Young	28½ „	One guinea-pig became tuberculous; the others died of an acute infection.

They show conclusively that tubercle bacilli can within a comparatively short space of time pass through intact intestinal mucous membrane and find their way into the mesenteric glands.

As to the subsequent course of infection the experiments with the chyle give no information.

Their negative character suggested the possibility that tubercle bacilli which had arrived in the mesenteric glands during the period of digestion of the experimental meal might be arrested and remain there until the chyle of the next or subsequent meals carried some of them further onwards and finally into the thoracic duct. To test the truth of this hypothesis a series of three puppies (*see* page 699) was fed with tuberculous material and killed at intervals of three, twenty-four and ninety-six hours respectively, emulsions of mesenteric glands, lung and bronchial glands (two cases) being inoculated into guinea-pigs; in each case before the dog was killed the thoracic duct in the neck was opened under an anæsthetic and chyle collected.

In the first two cases the guinea-pigs inoculated from the mesenteric glands became tuberculous, whilst those inoculated from the chyle, lung and bronchial glands (one case) remained healthy.

In the third case the guinea-pigs inoculated from the mesenteric glands and the one from the lung became tuberculous; those inoculated with chyle and bronchial gland remained healthy.

Another young dog (No. 94, page 701) was fed with 1 gramme of culture of tubercle bacilli mixed with milk and killed 31 hours afterwards.

Chyle, collected during two and a half hours before the death of the dog, and emulsions of various organs and glands, were inoculated into guinea-pigs. None of the guinea-pigs inoculated with chyle developed tuberculosis.

One of the guinea-pigs inoculated with an emulsion from an ileo-colic gland became tuberculous and one each of the two inoculated with emulsions from the mesenteric glands and the lung showed in 10 and 18 days respectively one tubercle in the omentum, in which tubercle bacilli were found, and no sign of disease elsewhere. The other guinea-pigs were killed and showed no tuberculosis or died too soon for tuberculosis to develop (*see* page 702).

The last two experiments show that in the dog tubercle bacilli gain access to the lungs very soon after their absorption from the alimentary tract.

Whether the dissemination from the mesenteric glands takes place along the lymph stream or by means of the blood stream has not been determined.

PIGS.

Five pigs were fed with emulsions of tuberculous organs rich in bacilli and killed at intervals of five hours, one, two, four and eighteen days after feeding respectively.

The last three Nos. 86, 88 and 90, were fed at the same time and with equivalent doses of emulsion; the amount was rather less in these cases than in the first two.

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[*] These guinea-pigs belonged to the batch of guinea-pigs, of which several showed spontaneous tuberculosis, obtained from a dealer in London and referred to in the report on the second series of special feeding experiments.

Emulsions of the mesenteric glands, liver and lung of the pig killed five hours after feeding were inoculated into guinea-pigs and none developed tuberculosis. Of the guinea-pigs inoculated with various tissue emulsions of the second pig, killed 24 hours after feeding, the one inoculated with the mesenteric gland emulsion became tuberculous; the others remained healthy. None of the guinea-pigs inoculated from the pigs killed two and four days after feeding developed tuberculosis; both guinea-pigs inoculated from the mesenteric glands of the latter unfortunately died in a few days of an acute infection.

In Pig 90, killed 18 days after feeding, bacilli were found to be present in the mesenteric glands, lung, a bronchial gland and the spleen but not in the liver; the tuberculosis in the guinea-pig inoculated with the spleen emulsion was very slight.

These experiments show that tubercle bacilli are rapidly disseminated in the body of the pig but are apparently absorbed more slowly from the alimentary tract than is the case with dogs.

MONKEY.

The experiment on the monkey was vitiated by the presence of tuberculous lesions in the lungs and bronchial glands; it is interesting to record, however, that none of the guinea-pigs inoculated with the chyle or with the emulsion of the mesenteric glands developed tuberculosis.

DETAILED DESCRIPTION OF THE EXPERIMENTS.

DOG 2 (OLD).

Fed on June 2, 1904, with 22 cc. of an emulsion of guinea-pig organs containing approximately 5,000,000,000 tubercle bacilli. The emulsion was mixed with about 60 cc. milk and administered by means of a stomach tube; no food had been given during the previous twenty-four hours.

The dog was anæsthetised five hours after the experimental feed and the thoracic duct exposed. An attempt to insert a cannula in the duct failed, so the chyle was allowed to accumulate in the wound cavity from which it was pipetted; 7 cc. were thus collected; 2 cc. were inoculated into each of two guinea-pigs, and 2·5 cc. were shaken up with ether and centifugalised. The two guinea-pigs were killed twenty-eight days after inoculation and were found healthy. The centrifugalised deposit consisted mainly of mononuclear leucocytes; one group of short bacilli in pairs stained blue was seen, but no tubercle bacilli.

The dog was killed about six and a half hours after being fed, and the mesenteric glands were removed, emulsified, and used for the inoculation of two guinea-pigs.

One of these guinea-pigs died in one and a half days of an acute infection; the other was killed twenty-eight days after inoculation and found healthy.

MICROSCOPICAL EXAMINATION.

Centrifugalised deposit of 2·5 cc. chyle - - - - - - -	No T.B.
Mesenteric gland emulsion - - - - - - - -	No T.B.

GUINEA-PIGS INOCULATED.

No. 1,031 (s) - -	With emulsion of mesenteric glands, removed 6½ hours after feeding.	Died 1½ days	Acute infection
No. 1,032 (i) - -		Killed 28 days	No tuberculosis.
No. 1,029 (s) - -	With 2·0 cc. chyle, collected 5½ hours after feeding.	,, ,,	Healthy
No. 1,030 (i) - -	With 2·0 cc. chyle, collected 6 hours after feeding.	,, ,,	,,

DOG 4 (ADULT).

Fed on June 24, 1905, after fasting for twenty-four hours, with about 125 cc. of an emulsion made from the tuberculous organs of two guinea-pigs and one rabbit. The emulsion was extremely rich in tubercle bacilli.

The emulsion was given by means of a stomach tube; the dog was afterwards given a meal of fat.

Three and a half hours after feeding the dog was anæsthetised and the thoracic duct exposed. The duct in this case split up into a number of small branches before entering the vein. A cannula was inserted and when about 3·5 cc. of chyle had been collected the dog ceased to breathe. A further 9 cc. of chyle was caused to flow by gently kneading the abdomen.

The abdomen was then opened and the mesenteric glands removed; an emulsion was made and inoculated into two guinea-pigs. These two animals were killed sixty-eight days after inoculation; the intraperitoneal one was healthy; the subcutaneous one showed general tuberculosis.

The chyle was collected into three separate test tubes and a guinea-pig inoculated from each tube. One of the guinea-pigs died of tuberculosis (spontaneous); one died of some other infection; the third was healthy.

The fat from 1 cc. chyle was extracted by ether and the ethereal extract centrifugalised; the deposit showed no T.B.

MICROSCOPICAL EXAMINATION.

Contents of duodenum - - - - - - -	No T.B.
Contents of ileum - - - - - - - -	Numerous T.B.
Chyle (centrifugulised deposit from 1 cc.) - - -	No T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric glands	No. 1076 (s)	Killed 68 days	Tuberculous
	No. 1077 (i)	,,	Healthy
With 3·5 cc. chyle, collected 4¼ hours after feeding	No. 1073	Died 16 days	Acute infection
,, 4 cc. ,, ,, 4½ ,, ,,	No. 1074	Killed 68 days	Healthy
,, 4 cc. ,, ,, 4¾ ,, ,,	No. 1075	Died 56 days	Spontaneous tuberculosis

DOG 10 (YOUNG TERRIER PUPPY).

Fed on July 25, 1904, with six ounces of an emulsion made from the tuberculous organs of one rabbit and one guinea-pig. The emulsion was rich in tubercle bacilli. Killed July 26, 1904, twenty-four hours later.

P.M. All the organs and glands in the body were normal to the naked eye.

MICROSCOPICAL EXAMINATION.

Contents of duodenum	1 T.B.
Contents of ileum	1 T.B.
Bronchial gland	No T.B.
Mesenteric glands	No T.B.
Liver	No T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric glands	No. 1146 (s)	Died in 2 days	Of an acute infection
	No. 1147 (i)	Died in 5 days	Of an acute infection.
,, ,, ,, lung tissue	No. 1143 (s)	Died in 1 day	Of an acute infection.
,, ,, ,, liver tissue	No. 1142 (s)	Died in 2 days	Of an acute infection.
,, ,, ,, spleen	No. 1144 (s)	Killed 107 days	Healthy.
,, ,, ,, bronchial gland	No. 1145 (s)		

DOG 28 (PUPPY).

Fed on September 12, 1904, by means of a stomach tube, with 140 c.c. of an emulsion made from the tuberculous organs of two rabbits and one guinea-pig; the emulsion was very rich in tubercle bacilli, many occurring in clumps; after injection the puppy was given a feed of milk and cream.

Four and a half hours after, the dog was anæsthetised and a cannula inserted in the thoracic duct. Chyle came away slowly, at the rate of about 2 c.c. every ten minutes; in colour it was rather less white than usual when fat absorption is in full progress; probably four and a half hours after was too late to begin collecting the chyle, seeing that the only fatty food given was milk.

The first 3 c.c. collected were shaken up with ether and centrifugalised; no tubercle bacilli were seen in a smear made from the deposit.

The rest of the chyle was inoculated into guinea-pigs. The dog was killed six and a half hours after feeding and the mesenteric glands, liver, and a bronchial gland were removed and used to inoculate guinea-pigs.

MICROSCOPICAL EXAMINATION.

Contents of stomach	Several T.B.
,, duodenum	,, ,,
,, ileum	Very numerous T.B.
Emulsion of mesenteric glands	No T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric gland	No. 1226 (s)	Died 15 days	No tuberculosis
,, ,, ,, ,,	,, 1227 (i)	Killed 61 days	Healthy
,, ,, liver	,, 1228 (i)	Died 10 days	Acute infection
,, ,, bronchial gland	,, 1229 (i)	Died 10 days	Acute infection

GUINEA-PIGS INOCULATED—*continued.*

With 4·0 cc. chyle	Collected 5¾ hours after feeding	No. 1230 (s)	Killed 61 days	Healthy
„ 2·5 cc. „	„ 6 „ „ „	„ 1231 (i)	„ 61 „	„
„ 4·0 cc. „	„ 6⅓ „ „ „	„ 1232 (s)	„ 61 „	Spontaneous tuberculosis
„ 4·0 cc. „	„ 6½ „ „ „	„ 1233 (i)	„ 61 „	

DOG 32 (VERY AGED).

Fed on October 3, 1904, with an emulsion made from the tuberculous organs and glands of three guinea-pigs and the lung of one rabbit.

The material was emulsified with milk and was passed into the stomach through an oesophageal bougie.

The dog was anæsthetised three and a half hours later and the thoracic duct exposed; the duct made a considerable arch before entering the vein and was in several places double. A cannula was inserted and some chyle collected. The flow of chyle was very slow and after 6 cc. had been collected ceased altogether.

The dog was then killed and emulsions were made from the mesenteric and ileo-colic glands and the liver. All the organs and glands appeared perfectly normal to the eye.

MICROSCOPICAL EXAMINATION.

Mesenteric gland emulsion	No. T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric gland	No. 1293 (s)	Killed 68 days	General tuberculosis.
„ „ „ „ „	No. 1294 (i)	„ „ „	„ „
„ „ of ileo-colic gland	No. 1291 (i)	„ „ „	Healthy.
„ „ of liver	No. 1292 (i)	„ „ „	„
With 2 cc. chyle collected 4¼ hours after feeding	No. 1295 (i)	„ „ „	„
„ 2 cc. „ „ 4½ „ „ „	No. 1296 (s)	„ „ „	„
„ 2 cc. „ „ 4¾ „ „ „	No. 1297 (i)	„ „ „	„

DOG 34 (PUPPY 6 to 7 WEEKS OLD).

Fed on November 10, 1904, with an emulsion made from the tuberculous lungs of two rabbits; the organs were emulsified with milk, the emulsion being introduced into the stomach through a stomach tube.

The dog was anæsthetised and the thoracic duct exposed. The dog at this point ceased to breathe and no attempt was made to insert a cannula; the duct was instead cut across and chyle allowed to flow into the wound from which it was pipetted; by gently pressing on the abdomen, 2 cc. were made to flow; this was diluted with an equal amount of saline and 2 cc. of the dilution inoculated into each of two guinea-pigs.

The mesenteric glands were removed, emulsified and inoculated into two guinea-pigs; an emulsion was also made of the left caudal lobe of the lung and inoculated intraperitoneally into one guinea-pig.

MICROSCOPICAL EXAMINATION.

Contents of duodenum	A few T.B.
Contents of ileum	Extremely numerous T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric glands	No. 1342 (s)	Killed 64 days	Healthy.
„ „ „ „	No. 1343 (i)	„ „ „	„
With emulsion of lung	No. 1344 (i)	„ „ „	„
With 1 cc. chyle collected 5 hours after feeding	No. 1340 (s)	„ „ „	„
„ „ „ „ „	No. 1341 (i)	„ „ „	„

DOGS 36, 38 and 40.

A series of three puppies, Nos. 36, 38 and 40, from the same litter, were fed on December 15th, 1904, at 12 noon each with 40 cc. of an emulsion made from the tuberculous organs of several rabbits; 25 mg. of culture of tubercle bacilli were added to the emulsion.

The emulsion was mixed with milk and was, in each case, injected into the stomach through an oesophageal bougie.

Three hours after feeding, one of the puppies, No. 36, was anæsthetised, and its thoracic duct exposed; the duct was severed and the chyle allowed to flow into the wound; the chyle came away very slowly and only 1 cc. was collected; the first few drops exuded three and a half hours after feeding.

The animal was killed and most of the mesenteric glands were removed and emulsified; with this emulsion two guinea-pigs were inoculated. The whole of the left lung was emulsified and inoculated into a guinea-pig.

The amount of tuberculosis in G.P.'s 1384 and 1385 was consistent with the inoculation of a small number of tubercle bacilli.

Microscopical Examination.

Contents of stomach	Numerous T.B.
,, ,, duodenum	A few T.B.
,, ,, ileum	Very numerous T.B.

Guinea-pigs Inoculated.

With mesenteric gland emulsion	No. 1384 (s)	Killed 36 days	Tuberculous
	No. 1385 (i)	,,	,,
With 1 cc. chyle, collected 3½ hours after feeding	No. 1383 (i)	,,	Healthy
With emulsion of lung	No. 1382 (i)	,,	,,

One of the remaining pups, No. 38, received no more food until the following day at 9. a.m., when it was given some milk. Two hours later it was anæsthetised and chyle was collected in the same way as in Dog 36. Chyle flowed very slowly, and it was possible to obtain only two lots each of slightly less than 1 cc. After the death of the dog, the mesenteric glands, right lung and left bronchial glands were removed and emulsified.

Microscopical Examination.

Contents of duodenum	No T. B.
,, ileum	T. B. easily found; 2 and 3 in every 4 to 6 fields.
Fæces	

Guinea-pigs Inoculated.

With emulsion of mesenteric glands	No. 1388 (s)	Killed 36 days.	Healthy.
	No. 1389 (i)	,,	Slight Tuberculosis.
With about 1 cc. chyle collected 23 hours after the experimental meal and two hours after the last feed	No. 1390 (i)	,,	Healthy.
With 1 c.c chyle collected 23½ hours after the experimental meal and 2½ hours after the last feed	No. 1391 (i)	,,	,,
With emulsion of lung	No. 1386	,,	,,
With emulsion of bronchial gland	No. 1387	,,	,,

The third pup, No. 40, was anæsthetised four days after the experimental feed, and two and a half hours after the last meal. 4·75 cc. chyle were collected from the thoracic duct and inoculated into three guinea-pigs; the dog died under the chloroform, and the last 2 cc. were collected by gently pressing on the abdomen.

Microscopical Examination.

Contents of ileum	No T. B.
,, rectum	Two doubtful T. B.

Guinea-pigs Inoculated.

With emulsion of mesenteric glands	No. 1395 (i)	Killed 36 days	Tuberculous.
,, ,, ileo-colic gland and piece of terminal mesenteric	No. 1396 (i)	,,	,,
With 0·75 cc. chyle collected 2½ hours after last meal	No. 1392 (i)	,,	Healthy.
With 2·0 cc. chyle collected 2¾ hours after last meal	No. 1393 (i)	,,	,,
With 2·0 cc. chyle collected 3 hours after last meal	No. 1394 (i)	,,	,,
With emulsion of lung	No. 1398 (i)	,,	Tuberculous (slight).
,, bronchial gland	No. 1397 (i)	,,	Healthy.

DOG 42 (AGE ABOUT 18 MONTHS).

Fed on February 1st, 1905, through a stomach tube, with an emulsion made from the tuberculous organs of one rabbit and several guinea-pigs, mixed with cream.

The dog was anæsthetised one and a half hours afterwards, and the thoracic duct exposed; an attempt to insert a cannula failed; the chyle was therefore allowed to flow into the wound, from which it was immediately pipetted; the dog was kept under the anæsthetic for four and three quarter hours, during which time about 60 cc. chyle were collected.

The chyle was never very rich in fat, and in the last hour of collection was quite thin and watery looking.

A series of 8 guinea-pigs was inoculated with the chyle and two guinea pigs were inoculated with an emulsion of some of the mesenteric glands.

MICROSCOPICAL EXAMINATION.

Contents of duodenum - - - - - - -	Fairly numerous T.B.
,, ,, ileum - - - - - - - -	Very numerous T.B.
Mesenteric gland emulsion - - - - -	No T.B.

ANIMALS INOCULATED.

With emulsion of mesenteric glands - - - - -	No. 1423 (s)	Killed 57 days	Healthy
	No. 1424 (i)	,,	,,
With 4·0 cc. chyle, collected 2¼–2½ hours after feeding - -	No. 1415 (i)	,,	,,
,, 6·0 cc. ,, ,, 2½–3¼ ,, ,, - -	No. 1416 (i)	,,	,,
,, 8·0 cc. ,, ,, 3¼–3¾ ,, ,, - -	No. 1417 (i)	Died 2 days	Volvulus and intussusception
,, 8·0 cc. ,, ,, 3¾–4¼ ,, ,, - -	No. 1418 (i)	Died 3 days	Intestine injured
,, 8·0 cc. ,, ,, 4¼–4¾ ,, ,, - -	No. 1419 (i)	Killed 57 days	Healthy
,, 8·0 cc. ,, ,, 4¾–5¼ ,, ,, - -	No. 1420 (i)	,,	,,
, 8·0 cc. ,, ,, 5¼–5⅔ ,, ,, - -	No. 1421 (i)	,,	,,
,, 8·0 cc. ,, ,, 5⅔–6¼ ,, ,, - -	No. 1422 (i)	Died 3 days	Intestine injured

DOG 94. (YOUNG.)

Fed on January 31, 1906, at 8 a.m. with 1 gramme of culture of tubercle bacilli derived from different bovine viruses.

The culture was given mixed with milk which the dog drank.

The dog was not given any more food until the following day at 9 a.m., 25 hours after the experimental meal, when it received a feed of milk.

Three hours after the last feed the dog was anaesthetised; the thoracic duct was exposed and a cannula inserted and tied in. Chyle came away slowly but steadily and was collected in samples of 2 cc. from 12.30 p.m. to 3 p.m. when the dog died. The chyle was allowed to flow into citrate of soda solution to prevent coagulation and altogether about 20 cc. were collected.

After the death of the dog emulsions were made from the mesenteric glands, ileo-colic gland, liver, spleen and lungs; these emulsions and the different samples of chyle were inoculated into guinea-pigs.

None of the guinea-pigs inoculated with chyle developed tuberculosis. One of the guinea-pigs inoculated with the ileo-colic gland emulsion became tuberculous and one each of the two inoculated with emulsions made from the mesenteric glands and the lung showed in 10 and 18 days respectively one tubercle in the omentum, in which tubercle bacilli were found, and no sign of disease elsewhere; the other guinea-pigs were killed and showed no tuberculosis or died too soon for tuberculosis to develop.

Cultures were sown from the chyle (5 tubes) and from the mesenteric and ileo-colic gland emulsions (1 tube each); all the tubes remained sterile.

Microscopical Examination.

Contents of duodenum - - - - - - - -	No tubercle bacilli.
,, ,, ileum - - - - - - - - -	No tubercle bacilli.
,, ,, rectum - - - - - - - -	Numerous tubercle bacilli.
Mesenteric gland emulsion - - - - - - -	No tubercle bacilli.
Centrifugalised deposit of 1 c.c. chyle collected after the death of the dog by pressure on the abdomen -	No tubercle bacilli.

GUINEA-PIGS INOCULATED.

All Intraperitoneally.

With emulsion of mesenteric glands	No. 1879	Died 10 days	One tubercle in omentum (T.B. found).
	No. 1880	„ 10 „	No tuberculosis.
„ „ ileo-colic gland	No. 1885	Killed 37 „	General tuberculosis.
„ „ lung	No. 1881	Died 18 „	One tubercle in omentum.
	No. 1882	„ 16 „	Subacute infection.
„ „ liver	No. 1883	Killed 37 „	No tuberculosis.
„ „ spleen	No. 1884	„ 37 „	„ „
With 2·0 cc. chyle. collected $3\frac{1}{2}$ to $3\frac{3}{4}$ hours after the last meal	No. 1869	„ 40 „	Healthy.
„ „ $3\frac{3}{4}$ to 4 „ „ „	No. 1870	„ 49 „	„
„ „ 4 to $4\frac{1}{4}$ „ „ „	No. 1871	„ 49 „	„
„ „ $4\frac{1}{4}$ to $4\frac{2}{3}$ „ „ „	No. 1872	Died 16 „	No tuberculosis.
„ „ $4\frac{2}{3}$ to $4\frac{5}{6}$ „ „ „	No. 1873	„ 7 „	„ „
„ „ $4\frac{5}{6}$ to 5 „ „ „	No. 1874	„ 16 „	„ „
„ „ 5 to $5\frac{1}{4}$ „ „ „	No. 1875	Killed 49 „	Healthy.
„ „ $5\frac{1}{4}$ to $5\frac{2}{3}$ „ „ „	No. 1876	„ 49 „	„
„ „ $5\frac{2}{3}$ to $5\frac{3}{4}$ „ „ „	No. 1877	„ 49 „	„
„ „ $5\frac{3}{4}$ to 6 „ „ „	No. 1878	„ 49 „	„

DOG 44 (Adult).

Fed on February 2nd with an emulsion made from the prescapular, mediastinal and other glands of Calf 228. The dog ate the emulsified tissue and was afterwards given a large amount of cream and milk.

Three hours later the dog was anæsthetised and the thoracic duct searched for; it was not found until after the death of the dog, and appeared to follow an abnormal course; the duct was severed, and 1 cc. of milky white chyle was collected, which was inoculated into a guinea-pig.

Microscopical Examination.

Contents of duodenum	No. T.B.
Contents of ileum	Very numerous T.B.

Guinea-pigs Inoculated.

With emulsion of mesenteric glands	No. 1426	Killed 70 days	Healthy.
„ „ „ „ „	No. 1427		
With 1 cc. chyle collected 4 hours after feeding	No. 1425		

DOG 46 (Adult).

Fed on February 21st with milk containing over 200 milligrammes of culture of tubercle bacilli. The cultures were derived from different viruses and were the remains of culture emulsions made for the inoculation of bovines and rabbits.

The dog was anæsthetised three hours after being fed, and died after a few whiffs of chloroform of heart failure.

Emulsions were made from the mesenteric glands and the bronchial gland and inoculated into guinea-pigs.

Microscopical Examination.

Contents of duodenum	Tubercle bacilli.
Contents of ileum	No tubercle bacilli.

Guinea-pigs Inoculated.

With emulsion of mesenteric glands	No. 1439	Killed 73 days	Healthy.
„ „ „ „ „	No. 1440		
„ „ „ bronchial gland	No. 1441		

PIG 50. (Age 8 weeks.)

Fed on 1st July, 1904, by means of a stomach tube, with about 150 cc. of an emulsion of the organs of two guinea-pigs and one rabbit.

The emulsion was very rich in tubercle bacilli and was mixed with an equal quantity of milk.

The pig had fasted for twenty-four hours before the experiment. Five hours after being fed the pig was chloroformed and an attempt was made to find the thoracic duct, which did not succeed.

The pig was killed and emulsions were made from the mesenteric glands, lung and liver ; separate emulsions were made from the anterior and posterior mesenteric glands.

Microscopical Examination.

Contents of duodenum (near pylorus) - - - - - - -	Numerous T.B.
„ „ ileum (near valve) - - - - - - - -	„ „
Emulsion of anterior mesenteric glands - - - - -	No T.B.
„ „ posterior mesenteric glands - - - - -	„
„ „ liver - - - - - - - - - - -	„
„ „ lung - - - - - - -	„

Guinea-pigs Inoculated.

With emulsion of anterior mesenteric glands - - -	No. 1086 (i)	Killed 61 days	Healthy
„ „ „ posterior mesenteric glands - - -	No. 1087 (i)	„ „	„
„ „ „ liver - - - - - - - -	No. 1088 (i)	„ „	„
„ „ „ lung - - - - - - - -	No. 1089 (i)	„ „	„

PIG 72.

Fed on 20th July, 1904 in the same way as Pig 50 with an emulsion of the tuberculous organs of rabbits and guinea-pigs: the emulsion was very rich in tubercle bacilli.

The animal was killed twenty-four hours later and emulsions were made from the mesenteric glands, lungs, left bronchial gland, liver and spleen.

Post-mortem.—All the organs and glands were normal in appearance.

Microscopical :—

One loopful of duodenal contents showed moderately numerous T.B.

A scraping from the mucous membrane of the ileum showed no T. B.

No T.B. were found in the emulsions made from the mesenteric glands, liver and lung.

Guinea-pigs Inoculated.

With mesenteric glands emulsion - - - - -	No. 1130 (i)	Killed 53 days	Tuberculous
„ emulsion of lung - - - - - - -	No. 1128 (i)	„ „	Healthy
„ „ bronchial gland - - - - -	No. 1131 (i)	„ „	„
„ „ spleen - - - - - - -	No. 1129 (i)	„ „	„
„ „ liver - - - - - - -	No. 1127 (i)	„ „	„

PIGS 86, 88, and 90.

Three young pigs, Nos. 86, 88 and 90, were fed on September 12th, 1904, with some of the same emulsion prepared for Dog 28 ; each pig received about 50 cc. mixed with milk through a stomach tube.

Pig 86 was killed two days later on September 14th, and emulsions of the mesenteric glands, liver, spleen and lungs were inoculated into guinea-pigs : some blood was withdrawn from the portal vein and 2 c.c. inoculated into a guinea-pig.

Post-mortem.—The organs and glands were perfectly healthy.

Microscopical Examination.

Contents of duodenum - - - - - - - - - - - - -	No T.B.
„ „ ileum - - - - - - - - - - - - -	No T.B.

GUINEA-PIGS INOCULATED.

With emulsion of mesenteric glands - -	No. 1236	Killed 71 days	Healthy.
	No. 1237	„	„
„ „ „ lung - - - -	No. 1240	„	„
	No. 1241	„	„
„ „ „ liver - - - - -	No. 1238	„	„
	No. 1239	„	„
„ „ „ spleen - - - - - -	No. 1234	„	„
With 2 cc. portal blood - - - - -	No. 1235	„	„

Pig 88 was killed four days after feeding.
Post-mortem.—The organs and glands were healthy in appearance and there was no sign of tuberculosis.

MICROSCOPICAL EXAMINATION.

Mesenteric gland emulsion - - - - - - - - - - - -	No T.B.
Liver emulsion - - - - - - - - - - -	No T.B.
Lung emulsion - - - - - - - - - - - -	No T.B.

GUINEA-PIGS INOCULATED.

With emulsion from mesenteric glands -	No. 1248	Died	Acute infection.
	No. 1249	„	„
„ „ „ lung - - - - -	No. 1244	Killed 69 days	Healthy.
	No. 1245	„	„
„ „ „ liver - - - -	No. 1246	„	„
	No. 1247	„	„
„ „ „ spleen - - - -	No. 1242	„	„
„ „ „ left bronchial gland - -	No. 1243	„	„

PIG 90.

Killed September 30th, 1904, eighteen days after feeding.

Post-mortem.—Intestines normal.

A Mesenteric Gland here and there appeared to be firmer than normal, but no opaque foci were seen; the group of ileo-colic glands were similarly slightly hardened.

The Liver showed one minute yellow point; otherwise normal.

Spleen and Kidneys.—Normal.

Lungs.—In one lobe beneath the pleura there was a translucent nodule the size of a pin's head; with this exception the lungs were quite normal in appearance.

Bronchial Glands.—Normal.

MICROSCOPICAL EXAMINATION.

Mesenteric gland emulsion - - - - - - - - - - - - -	No T.B.
Lung emulsion - - - - - - - - - - - -	„ „
Lung nodule - - - - - - - - - - - - -	„ „

GUINEA-PIGS INOCULATED.

With mesenteric gland emulsion - - - -	No. 1289 (s)	Died 59 days	General tuberculosis.
	No. 1290 (i)	„ 48 „	„ „
„ lung emulsion - - - - - -	No. 1285 (s)	„ 2 „	Acute infection.
	No. 1286 (i)	„ 56 „	General tuberculosis.
„ liver emulsion - - - - - -	No. 1287 (s)	Killed 59 „	Healthy.
	No. 1288 (i)	„ 59 „	„
„ spleen emulsion - - - - - -	No. 1283 (i)	„ 59 „	Slight tuberculosis.
„ bronchial gland emulsion - - -	No. 1284 (i)	„ 59 „	General tuberculosis.

MONKEY 84 (Adult Male).

Arrived at Walpole, May 20th, 1904.

At Isleworth this monkey had been in actual contact with another rhesus monkey which was found on post-mortem examination to have spontaneous tuberculosis; it was therefore used for a distribution experiment.

On June 10th, 1904, a stomach tube was passed and 30 to 40 c.c. of a dilute milky emulsion of culture from G.P. 14, Cow 44, and Virus IV. were injected into the stomach, followed by 30 cc. thick cream. Two and a half hours later the monkey was anæsthetised and the thoracic duct exposed. The duct was distended with milky fluid showing that fat digestion was in full progress; it was situated low down behind the clavicle and was difficult of access. An attempt to insert a cannula failed and the chyle was allowed to flow into the wound from which it was pipetted into test tubes; in this way 6·5 cc. were collected.

Whilst the animal was still under the anæsthetic an incision was made through the abdominal wall and the intestines were drawn through the opening. Several lacteals between the intestine and the mesenteric glands were severed and some of the chyle was collected. Chyle was collected in a similar way from the afferent lacteal vessels. The chyle in each case, naturally a very small quantity, was diluted with normal saline and inoculated into a guinea-pig.

The mesenteric glands were removed after the death of the animal, emulsified and inoculated into two guinea-pigs.

Post-mortem.—In the substance of the liver under the capsule there was a spherical yellow nodule, 2·5 mm. in diameter, containing thick yellow pus. (No T. B. found; there were a few organisms stained blue.)

The Lungs showed numerous small thin-walled cyst containing the *Pneumonyssus*; around the margins of the lungs were large emphysematous blebs in the interior of which the same parasites were seen. In the apex of the right upper lobe there was a pea-sized nodule with grey translucent margins and yellow caseous centre. There was a pea-sized nodule in each of the caudal lobes with thick fibrous walls and thin turbid contents. Along the upper border of the right lower lobe there was a greyish gelatinous consolidated patch; near the bronchus connected with this patch there was an enlarged gland showing softened caseous areas. An intertracheo-bronchial gland was much enlarged, extensively caseated and softened. There was no sign of tuberculosis in any other organ or gland. Cultures of tubercle bacilli were isolated from the latter gland.

Guinea-pigs Inoculated.

With emulsion of mesenteric glands	No. 1052 (s.) No. 1053 (i.)	Killed 102 days	Healthy.
„ chyle from thoracic duct 4½ hours after feeding	No. 1050	Died 65 days	„
„ „ „ „ 5 hours after feeding	No. 1051	Died 22 days	„
„ chyle collected from the afferent lacteals	No. 1054	Killed 102 days	„
„ „ „ „ efferent lacteals	No. 1055		
„ emulsion of bronchial gland	No. 1056	Died 3 days	Acute infection.

SUMMARY OF FEEDING EXPERIMENTS.

Feeding experiments with the bovine tubercle bacillus have been carried out with two objects.

1. To ascertain the relative susceptibility of different species of animals to this mode of inoculation.
2. To study the anatomical distribution of tuberculosis produced by feeding.

Altogether 318 animals have been fed, including 15 distinct species.

The majority of these have been fed with single doses of tubercle bacilli, either in the form of culture or contained in tuberculous milk; the rest were fed for varying periods with tuberculous milk, except in one case where culture was used.

RACIAL SUSCEPTIBILITY.

The method of inoculation by feeding is a less certain and a less severe method of producing tuberculosis than any of the other methods, and in general a larger dose of the infecting agent is necessary to produce a given effect.

In feeding experiments, with single doses especially, many conditions may be present which may have an influence on the result.

A catarrh of the mucous membrane, by causing the rapid expulsion of the intestinal contents, may result in the animal escaping infection; the period with which the bacillus is in contact with the mucous membrane is no doubt a factor of some importance; the longer bacilli remain in the alimentary canal the more likely are they eventually to become absorbed.

Moreover, bacilli may be more readily absorbed from the alimentary canal of some animals than from that of others; they are very readily absorbed in pigs, and apparently less readily in guinea-pigs.

Individual susceptibility no doubt exercises as important an influence on the result in feeding experiments as in other forms of inoculation.

It is obvious, therefore, that a classification of susceptibility based upon the amount of disease produced by the ingestion of a definite dose of tubercle bacilli cannot be made with the same precision as by subcutaneous inoculation, where all the bacilli inoculated remain in the tissues of the animal.

The experiments, nevertheless, bring out clearly certain facts as to susceptibility which are confirmed by the subcutaneous inoculations.

The different species of animals used in the investigation can be classified into three groups.

In the first group the animals are very susceptible to the action of the tubercle bacillus, and infection, however small the dose, is almost invariably followed by general progressive tuberculosis. The animals placed in this group are the chimpanzee, baboon, rhesus monkey, lemur, rabbit and guinea-pig.

In the second group general progressive tuberculosis can be set up, but this depends on the dose of the infecting agent and on the age of the animal.

This group includes the pig, the goat, the calf, the cat and the dog. In all these species, with the possible exception of the young pig, when the dose is small the tuberculosis may be limited to and arrested in the glands along the alimentary tract, and, whereas in the first group the age of the animal does not affect the result, in this group the adults are in all cases less susceptible than the young. These species exhibit varying degrees of susceptibility to tuberculosis, the young pig being the most susceptible, the adult dog the most resistant. The goat is less susceptible than the pig, and the calf apparently less susceptible than the goat. Cats are much more easily infected than dogs. General progressive tuberculosis is with difficulty set up in dogs, the adults of the species being more highly resistant than the young.

In the third group are included the rat and the fowl, which are apparently insusceptible to tuberculosis by feeding. Several rats have been fed with enormous numbers of tubercle bacilli, and nothing has been found in them beyond some minute necrotic foci in the mesenteric glands. In the few experiments performed with fowls no disease at all has been produced.

COURSE OF INFECTION.

The introduction of tubercle bacilli into the alimentary tract is not necessarily followed by the development of tuberculosis, and when fed with tuberculous material the most susceptible animals may escape infection; the bacilli in such cases either pass straight through the canal, or if absorbed are taken up by leucocytes and destroyed. When tubercle bacilli are absorbed from the alimentary tract, either through the tonsils and pharyngeal mucous membrane or through the intestinal mucous membrane, they may remain in the mucous membrane and set up characteristic tuberculous lesions, or they may pass through the mucous membrane into the nearest glands and leave no trace of their passage.

Furthermore, it has been conclusively shown that tubercle bacilli which have been ingested may within a very short time find their way into the lungs, where they set up tuberculous lesions; pulmonary tuberculosis so induced may or may not be accompanied by lesions in the mucous membrane of the alimentary tract, or glands in connection with it.

In all species of animals, whenever generalised tuberculosis is produced by feeding, the lungs are usually affected, often to a greater extent than any other organ in the body.

The bronchial glands almost invariably become affected after the lungs; in none of the experiments is there any evidence that the reverse has occurred; in a few instances lesions have been found in the thoracic glands without apparent disease of the lungs.

The anatomical distribution of tuberculosis and the naked eye characters of the lesions vary in different species of animals.

Chimpanz
Monkeys a
Baboons.

Chimpanzees and the various species of monkeys are very susceptible and the tuberculosis usually runs a progressive course.

In these animals the mucous membrane of the alimentary tract is specially liable to infection, and typical tuberculous ulcers may be found along the whole length of the small intestine. The tonsils, although apparently not so liable to infection as the intestines, have been frequently attacked and in several cases entirely destroyed by caseation. The associated lymphatic glands always become enlarged and caseous, and frequently suppurate; sometimes by fusing together they form very large tumours both in the neck and the mesentery.

The lesions in the organs and glands of these animals show a marked tendency to caseate and soften.

The omentum and peritoneum very soon become infected; in several instances the process was so intense as to resemble an intraperitoneal inoculation.

A striking feature in baboons is the frequency with which the lymphatic vessels in the mesentery, extending between an ulcer and the enlarged glands, become tuberculous, and this may be succeeded by great thickening and tuberculous infiltration of the mesentery itself, with secondary ulceration of the mucous membrane of the bowel attached to it.

In several instances in the baboon caseous nodules and typical tuberculous ulcers have been found in the stomach.

Guinea-pi
and Rabbi

In guinea-pigs and rabbits there may or may not be lesions at the sites of entry of the bacillus; both species are very susceptible, and infection appears to be always followed by progressive tuberculosis which in the end would terminate fatally; the characters of the lesions found in the internal organs do not differ from those produced by subcutaneous inoculation.

The anatomical distribution of the tuberculosis differs in important respects in these two species. The lungs and kidneys of the rabbit in cases of general tuberculosis are always more severely affected than the liver and spleen; often the latter organs are perfectly healthy. In guinea-pigs, on the other hand, the liver and spleen are always more severely affected than the lungs and kidneys; the kidneys only rarely contain tubercles.

Pigs.

Tuberculosis is readily set up in pigs, and in the young of the species is usually of a progressive type; the adult pig, although readily infected, is much more resistant than the young one and the disease may even be arrested in the nearest glands.

The intestinal mucous membrane often escapes infection, the bacilli passing through without leaving a trace of their passage; when lesions occur they are usually few and inconspicuous. The tonsils and pharyngeal mucous membrane are more frequently affected than the intestines, and the glands of the neck are usually more extensively tuberculous than the glands in the mesentery.

In young pigs tubercle bacilli are disseminated into the internal organs very soon after their administration, and miliary tubercles may be found in all the organs, but chiefly in the lungs and liver, six weeks after inoculation. These tubercles in animals which have lived some time may attain the dimensions of a pea and have caseous and calcareous centres and fibrous margins; in the lungs a tuberculous pneumonia sometimes develops, and this may affect the whole of a lobe or be limited to single lobules. The bronchial and portal glands become tuberculous after the lungs and liver.

Infection soon spreads to the serous surfaces, an eruption of nodules appearing first in the omentum and on the peritoneum; on the peritoneum the nodules are found chiefly on the right side of the diaphragm and between the coils of the large intestine.

The calf is much less susceptible to tuberculosis than the pig, and a larger dose of bacilli is necessary to produce a generalised disease.

22 calves altogether have been fed with tuberculous material (*see* pages 500, 536, 591, and 630), and in two only of these was general tuberculosis produced; in some of the others a few calcareous nodules were found in the internal organs, whilst in the rest the disease had not in the period of observation extended beyond the nearest glands.

The intestines of the calf are more liable to infection than those of the pig; in all except one, in which the disease was limited to a pharyngeal gland, tuberculous nodules or ulcers were found. In the two cases in which general tuberculosis was produced the tuberculous process was very severe along the whole length of the alimentary canal (in one of the cases numerous large nodules were found in the wall of the stomach) and the glands in connection with it were extensively implicated. In the calf tuberculosis of the pleura or mediastinal glands may occur without disease of the lungs.

Goats.

Feeding experiments with goats have not been numerous; the animal is readily infected and general progressive tuberculosis has been set up, but, probably owing to the smallness of the doses, in the majority of the cases the tuberculosis has been limited for the most part to the alimentary tract and glands in connection with it.

The tuberculous lesions in the organs of the goat show a greater tendency to soften and break down than they do in the calf, and in the lungs, as was seen in a subcutaneous inoculation, may ulcerate and discharge their contents into the bronchi.

Cats.

In cats the mucous membrane of the alimentary tract is not frequently affected, and with small doses of bacilli the disease may not extend beyond the nearest glands; when generalisation occurs infection spreads first to the lungs which in three cases were affected by a miliary tuberculosis and in two others showed discrete nodules.

Dogs.

Dogs are very resistant to tuberculosis by feeding, especially the adults of the species, and in only one case, that of a puppy, has the disease been at all severe. The mucous membrane of the alimentary tract is rarely attacked.

An interesting anatomical feature in this species is the frequency with which lesions have been found in the lungs, without apparent disease of the alimentary tract or glands in connection with it.

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† The rabbits, guinea-pigs, rats, and mice are indexed in groups and not separately as in the case of other species.

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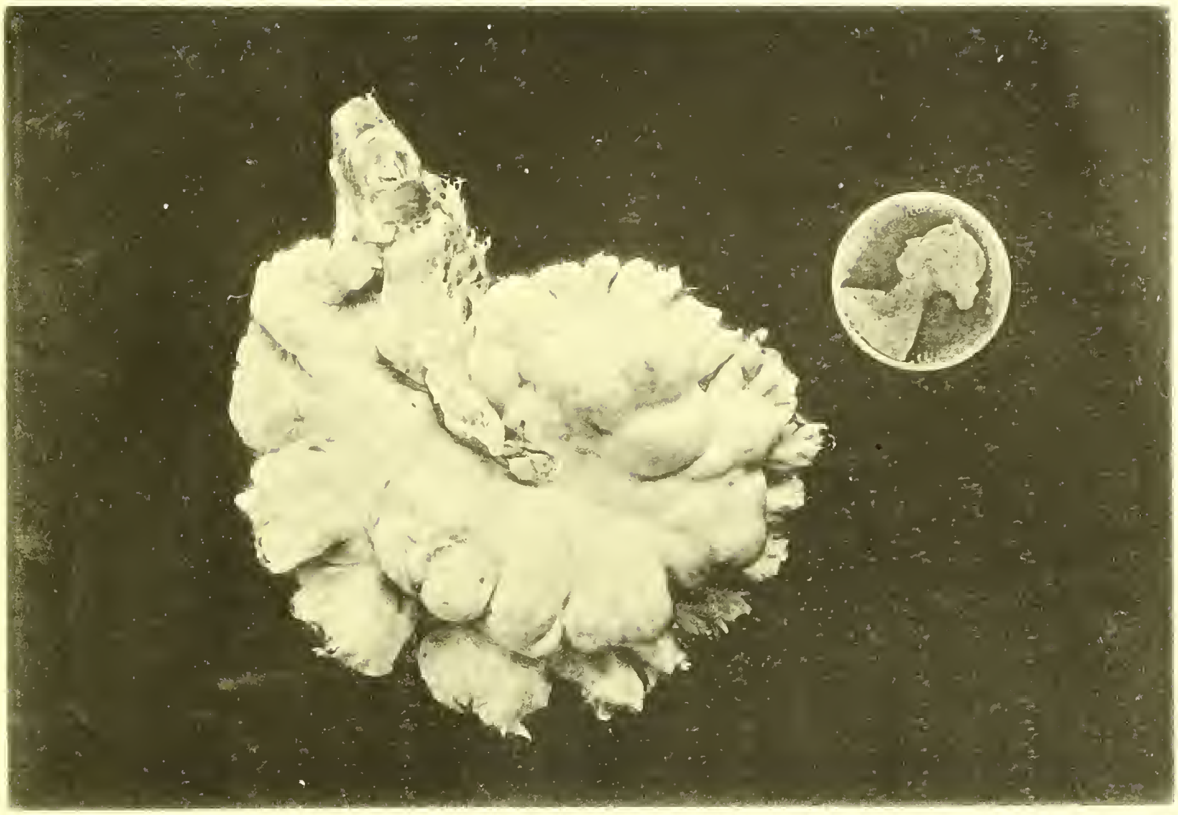
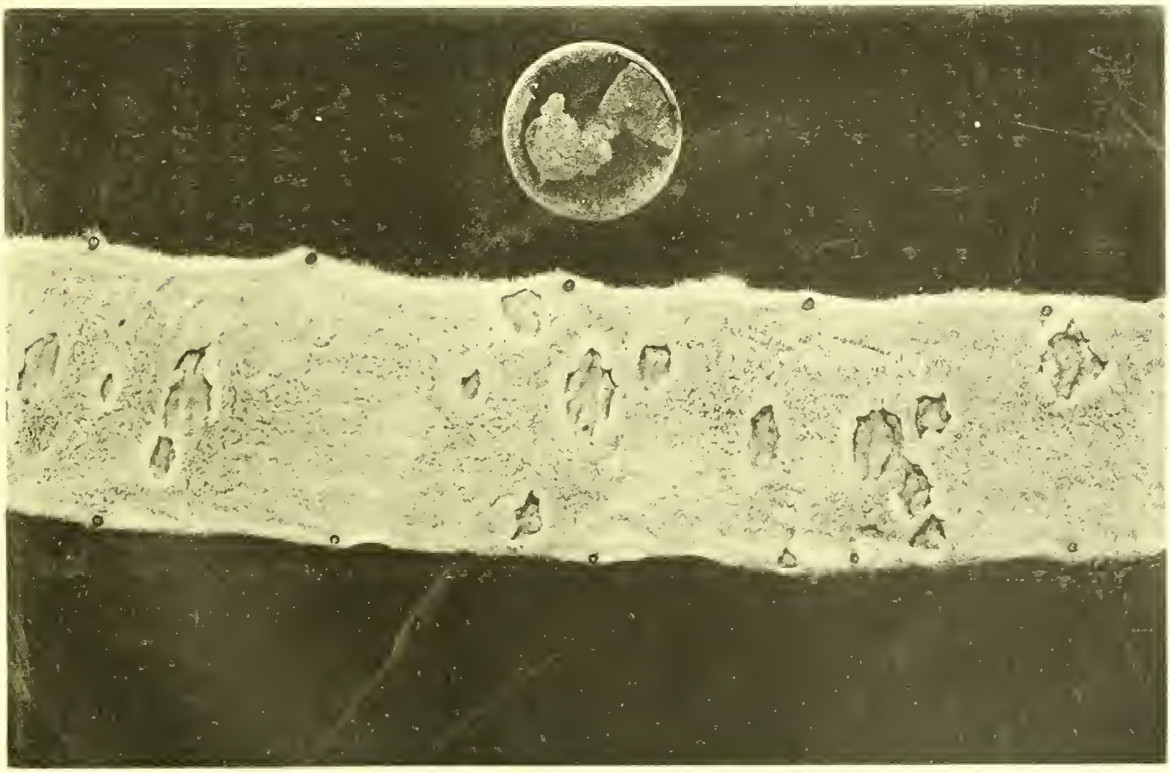
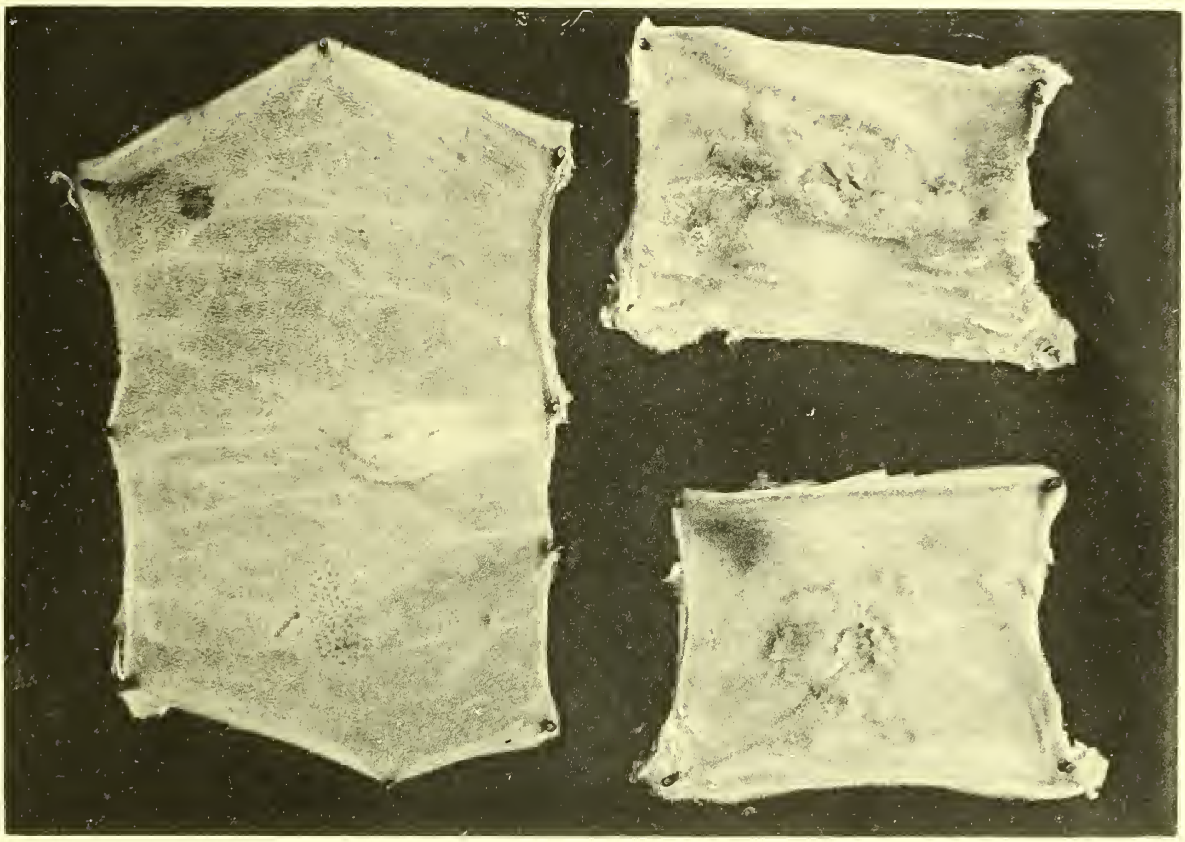


CHIMPANZEE 6. Fed with the tuberculous milk of Cow 172. (Virus B IV.)
Enlarged mesenteric glands

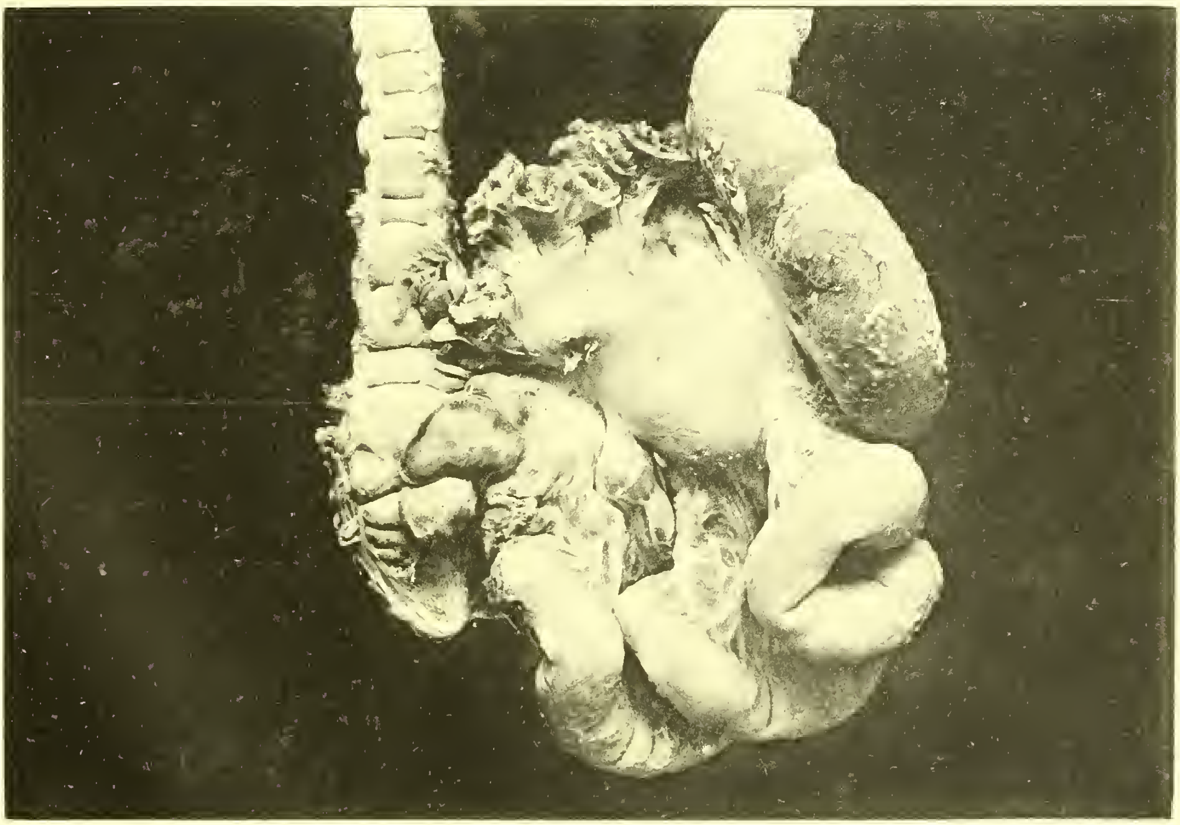


CHIMPANZEE 6. Fed with the tuberculous milk of Cow 172. (Virus B IV.)
Mucous surface of upper part of small intestine, showing tuberculous ulcers

Plate 2.

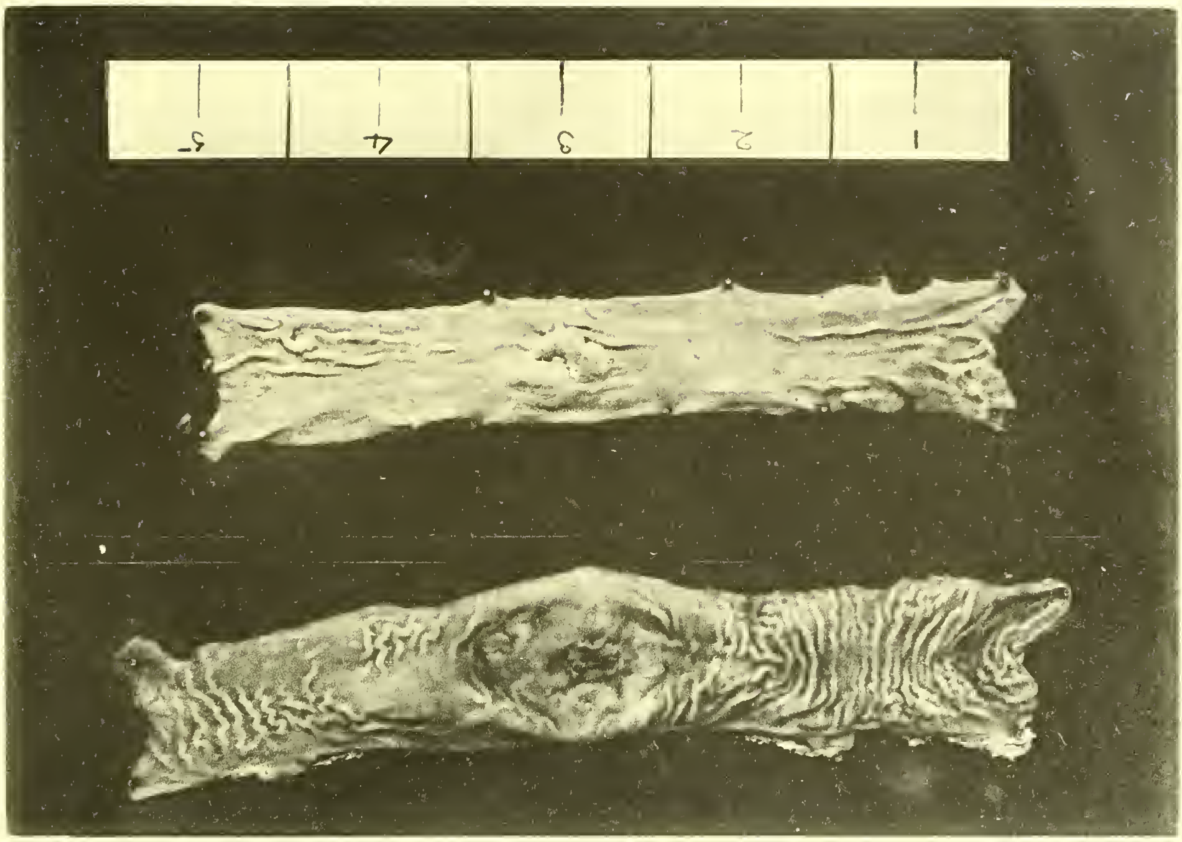


BABOON 20. Fed with the tuberculous milk of Cow 172. (Virus B. IV)
Pieces of small intestine, showing tuberculous ulcers.

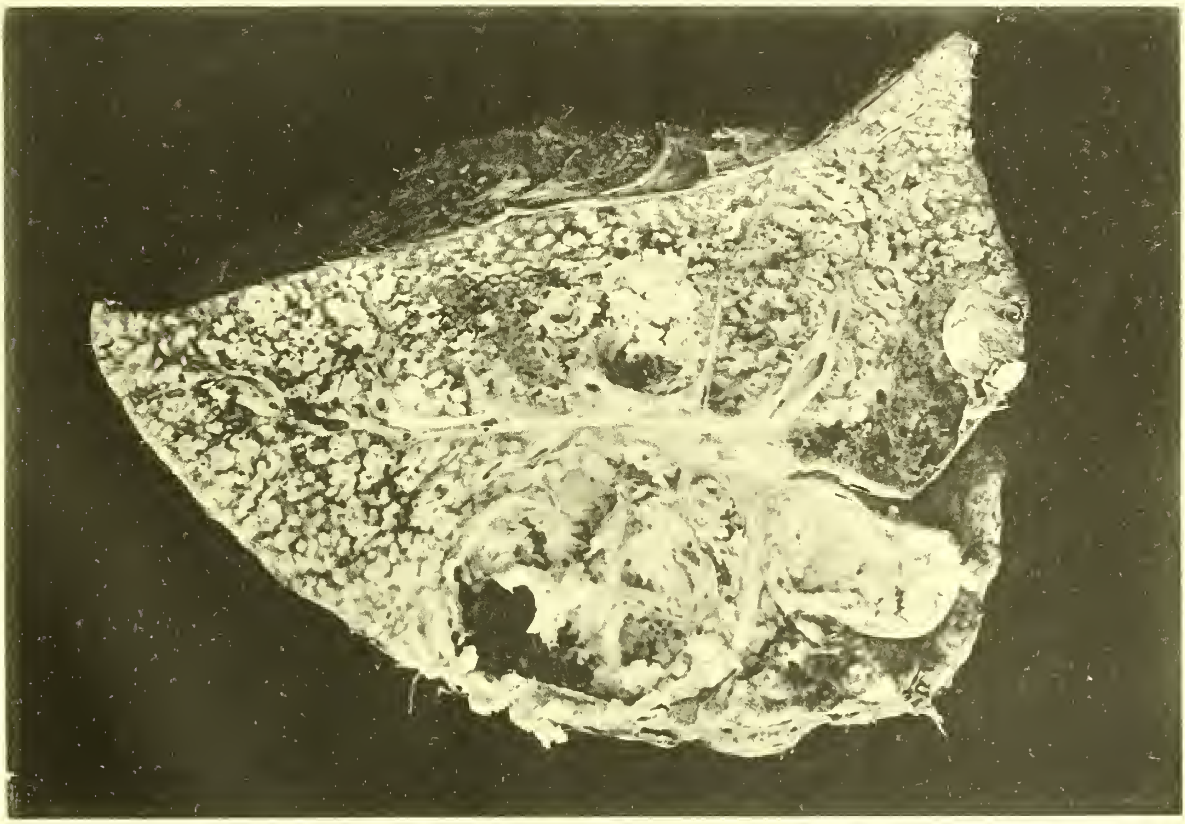


BABOON 2. Fed with the tuberculous milk of Cow 64. (Virus B. I)
Intestines and enlarged tuberculous mesenteric glands.

Plate 3.

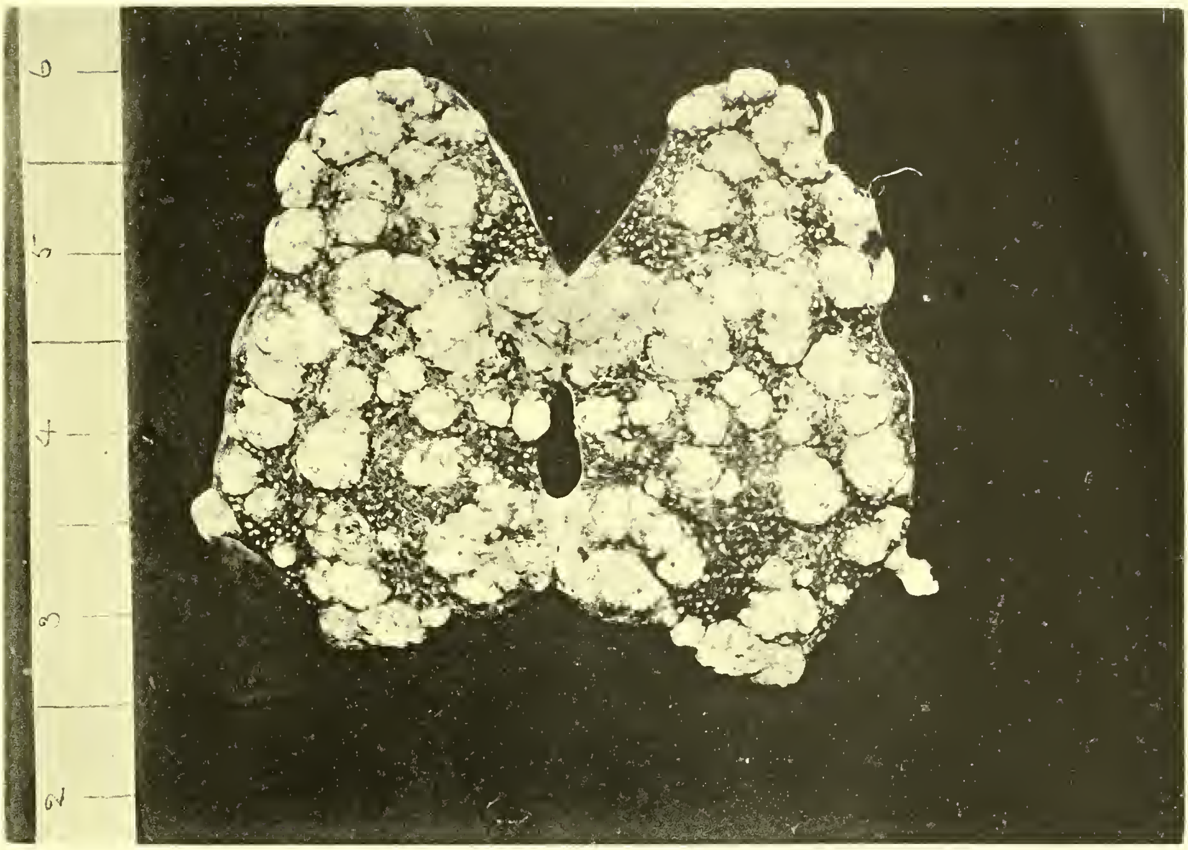


MONKEY 78. Fed with 0·01 milligramme of culture derived from Cow 44 (Virus B.I.)
Pieces of the small intestine, showing tuberculous ulcers

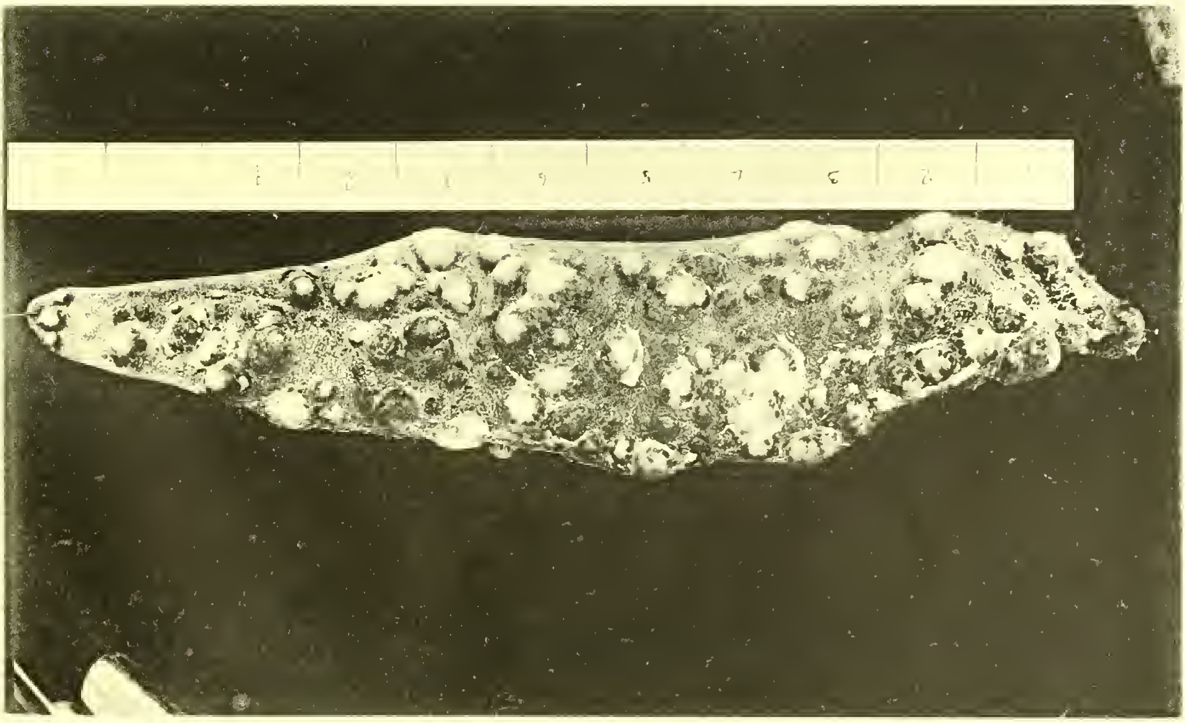


MONKEY 80. Fed with 0·01 milligramme of culture derived from Cow 44 (Virus B.I.)
Lung, cut surface of right lower lobe

Plate 4.

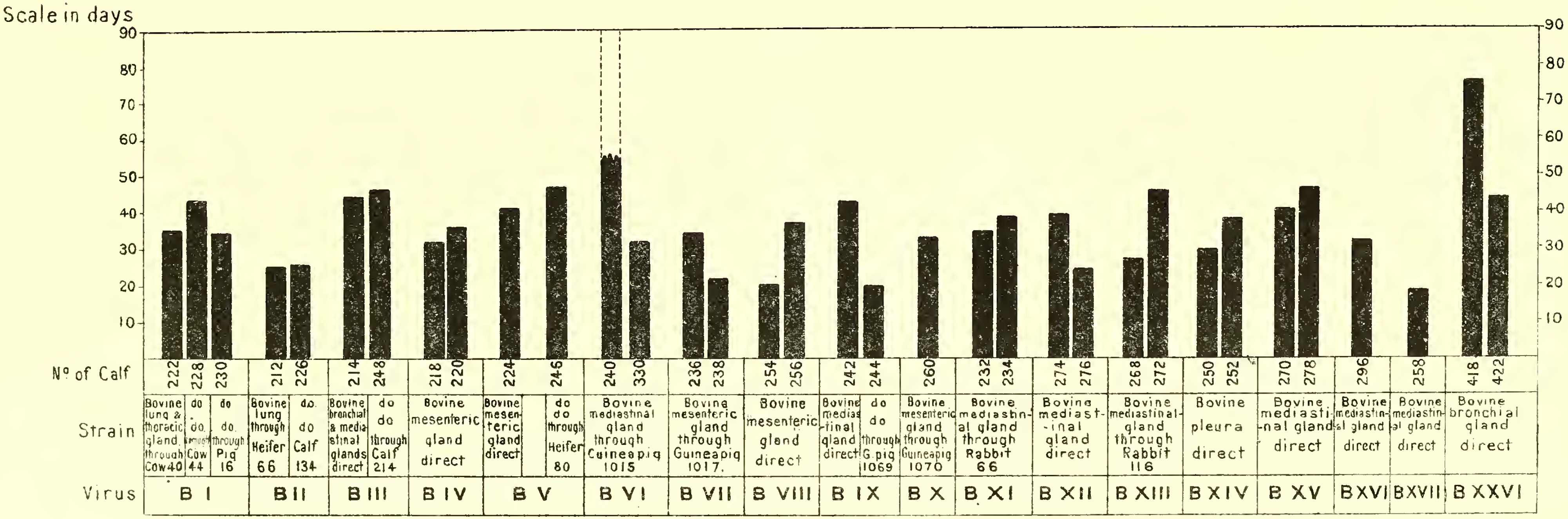


BABOON 12. Fed with the tuberculous milk of Cow 64 (Virus B.I.)
Spleen, cut surface.



PIG 20. Fed with the tuberculous milk of Cow 64. (Virus B.I.)
Spleen, convex surface.

CHART SHOWING THE LENGTH OF LIFE OF CALVES AFTER SUBCUTANEOUS INOCULATION OF 50 MILLIGRAMMES OF CULTURE.



NOTE – Calf 240 was killed after 54 days, but would undoubtedly have lived until the end of the 90 day limit. All the others died or were in a dying condition when killed, and were found to have severe general tuberculosis.

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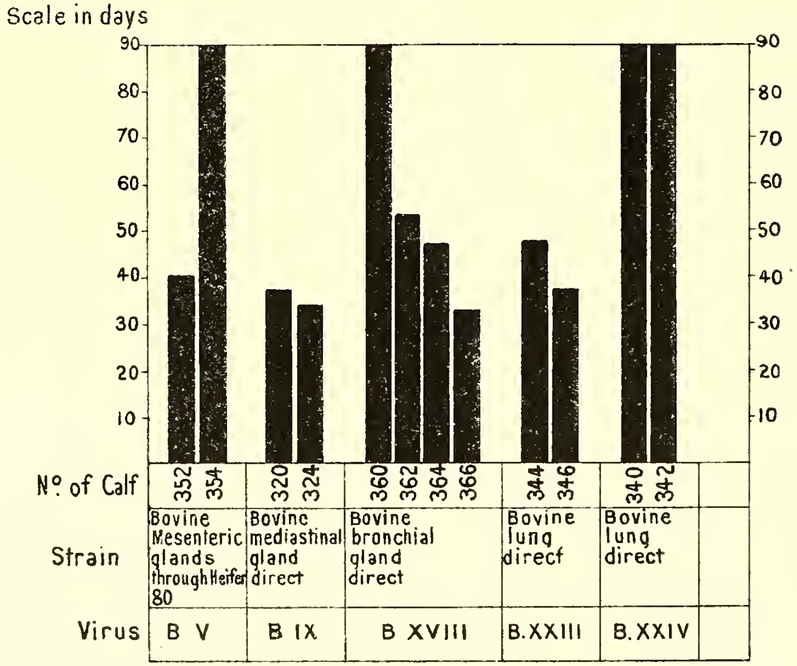
CHART SHOWING THE LENGTH OF LIFE OF CALVES AFTER SUBCUTANEOUS INOCULATION OF 10 MILLIGRAMMES OF CULTURE.



NOTE:— Three of the Calves which reached the 90 day limit were killed when in good health; The fourth, Nº 340 appeared ill. All the others died, or were in a dying condition when killed, and were found to have severe general tuberculosis.

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